Massachusetts Births 2001

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EXECUTIVE SUMMARY

2001 Highlights: Trends

- **The teen birth rate continues its steady decline of the last ten years**. In 2001, the teen birth rate was 24.3 births per 1,000 females ages 15-19, compared to 25.8 in 2000. The teen birth rate has declined 31% since 1990.

- **The infant mortality rate increased from 2000 to 2001, from an all-time low of 4.6 infant deaths per 1,000 live births in 2000 to 5.0 in 2001**. This increase was not statistically significant. Despite the increase between 2000 and 2001, the overall trend of decreasing infant mortality remains stable in Massachusetts. The infant mortality rate has decreased by 29% since 1990.

- **Cesarean section delivery rates continue to increase in Massachusetts**. In 2001, 25.6% of all births to Massachusetts residents were delivered by c-section. This is an 8% increase from the 2000 c-section rate. Since 1997, c-section rates have increased by an average of 7% per year.

- **The percentage of women smoking during pregnancy decreased** from 9.7% in 2000 to 9.1% in 2001. The rate of smoking during pregnancy has decreased 53% since 1990 (19.3%).

- **The ten-year trend of increasing numbers of multiple births continues**. The percentage of multiple births increased slightly from 4.3% of births in 2000 to 4.4% in 2001. The percentage of multiple births in Massachusetts has increased 69% since 1990 (2.6%).

Number and Rate of Births

The number of births to Massachusetts residents declined by about 1% between 2000 and 2001, from 81,582 to 81,014. Since 1990, the number of births in Massachusetts has declined by 12%, and the birth rate among women of reproductive age has declined by 9% (from 62.1 to 56.8 births per 1,000 females ages 15-44).

Infant Mortality

The infant mortality rate (IMR) in 2001 was 5.0 infant deaths per 1,000 births, compared with 4.6 in 2000. The infant mortality rate has decreased 29% since 1990. There were a total of 407 infant deaths in 2001, compared with 377 in 2000.

The IMR decreased among black non-Hispanics (12.8 to 12.1), but increased for Hispanics (5.2 to 7.3) and white non-Hispanics (3.8 to 4.1) from 2000 to 2001. The IMR for Asians decreased from 4.1 to 3.1. Note: the IMR for Asians should be interpreted with caution due to the small number of infant deaths involved.

Pregnancy-Associated Mortality

In 2001, 21 pregnancy-associated deaths, including 4 maternal deaths, occurred in Massachusetts. The pregnancy-associated mortality ratio (PAMR) was 25.5 pregnancy-associated deaths per 100,000 live births occurring in Massachusetts, and the maternal mortality ratio (MMR) was 4.9 maternal deaths per 100,000 live births occurring in Massachusetts. Although there was some fluctuation in the PAMR and the MMR between 1990 and 2001, the differences are not statistically significant due to the small number of occurrences.

(Note: A "Pregnancy-associated death" is the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of the cause of death. A "maternal death" is the death of a woman while pregnant or within 42 days of pregnancy, the cause of which is related to the pregnancy or its management. See Glossary for detailed definitions.)

Teen Births

Teen births decreased between 2000 and 2001, from a total of 5,305 births to females ages 15-19 to 4,979 births. The rate in 2001 was 24.3 births per 1,000 females ages 15-19, a 6% decrease from the 2000 rate of 25.8. The teen birth rate in Massachusetts has declined by 31% since 1990.

The low birthweight percentage among births to teen mothers (ages 15-19) was 9.8% in 2001, compared with 7.0% among births to mothers ages 20 and older in 2001.

Among Massachusetts municipalities in 2001, **teen birth rates were highest in Lawrence** (**95.2** per 1,000 females ages 15-19), Holyoke (87.9), Chelsea (80.8), Southbridge (77.3), and Springfield (71.4).

Low Birthweight

The percentage of low birthweight infants (LBW; weighing less than 5.5 pounds) increased to 7.2% in 2001 (from 7.1% in 1999 and 2000). Since 1990, the percentage of low birthweight infants has increased by 24%, from 5.8% in 1990 to 7.2% in 2001.

Between 2000 and 2001, the percentage of low birthweight infants increased slightly for white non-Hispanics (6.4% to 6.6%), decreased by 7% for black non-Hispanics (12.0% to 11.2%), and remained the same for Hispanics (8.2%) and Asians (7.3%).

Between 2000 and 2001, the percentage of low birthweight births remained the same (5.1%) among singletons, decreased slightly among twins (50.0% to 49.2%), and increased slightly among triplet and higher order births (92.5% to 93.3%). For the second year in a row, LBW decreased slightly among all multiple births (53.0 % to 52.0%), after a four-year trend in increasing rate of LBW among multiples. Very low birthweight (VLBW; infants weighing less than 3.3 pounds) remained stable between 2000 and 2001 (1.4%). For the second year in a row, Black non-Hispanic infants, who have the highest percentage of VLBW, experienced a small decrease in VLBW, from 3.6% in 1999 to 3.4% in 2000 to 3.2% in 2001.

Preterm Deliveries

The percentage of preterm infants (delivered before the 37th week of gestation) decreased from 8.3% in 2000 to 8.0% in 2001. Preterm rates decreased for all race and Hispanic ethnicity groups, but decreases were greatest for Asians (a 15% decrease; from 7.4% to 6.3%) and black non-Hispanics (a 5% decrease; from 12.7% to 12.1%).

The percentage of infants delivered very early (before the 28th week of gestation) remained the same in 2001 as in 2000 (0.6%). As in 2000, the percentage of infants delivered before 28 weeks of gestation among black non-Hispanics in 2001 (2.0%) was more than double that of any other group.

Births by Race, Hispanic Ethnicity, and Mother's Birthplace

Continuing the trend of the past 20 years, the percentage of births to white mothers decreased slightly, while the **percentage of births to other race/ethnicity groups increased**. In 2001, 73.0% of births were white non-Hispanic, 11.6% Hispanic, 7.2% black non-Hispanic, 5.9% Asian, 2.1% were other races, and 0.2% were of unknown race.

The percentage of births to non-U.S.-born mothers increased 6% between 2000 and 2001 – from 20.9% to 22.1%. **In 2001, more than 1 of every 5 births to Massachusetts residents was to a mother born outside the continental U.S., Puerto Rico, and the U.S. Territories.**

Smoking

The percentage of women who smoked during pregnancy decreased from 9.7% in 2000 to 9.1% in 2001. Decreases in smoking during pregnancy occurred among all race and Hispanic ethnicity groups.

Prenatal Care

Adequacy of prenatal care increased from 83.3% in 2000 to 85.2% in 2001. Adequacy of prenatal care is a measure of the timing and number of prenatal care visits, not an assessment of the quality of prenatal care. [Please note: these data are not comparable to data published in previous reports. Beginning with this year's report, the APNCU Index is used to measure adequacy of prenatal care, replacing the Kessner Index. Please see Chapter 5 for more detail.]

Cesarean Sections

The cesarean section delivery rates are increasing. The cesarean section rate among births to Massachusetts residents was 25.6% in 2001, an increase of 8% from 2000 (23.8%). Increases were among both primary and repeat c-sections. The primary c-section rate increased by 6%, from 17.7% to 18.7%, and the repeat c-section rate increased by 7%, from 75.2% to 80.6%. Accordingly, the rate of vaginal births after cesarean section (VBAC) deliveries decreased substantially, from 24.8% in 2000 to 19.4% in 2001, a decrease of 22%.

Breastfeeding

The rate of mothers breastfeeding or intending to breastfeed increased from 73.8% in 2000 to 75.3% in 2001. The breastfeeding rate increased for all major race/Hispanic ethnicity groups, but the largest increase between 2000 and 2001 was among Asians (5% increase; from 76.4% to 79.8%), followed by Hispanics (4% increase; from 75.4% to 78.1%), black non-Hispanics (3% increase; from 73.3% to 75.8%) and white non-Hispanics (1% increase; from 73.3% to 74.3%).

Public Source of Prenatal Care Payment

The percentage of mothers paying for prenatal care through a public source **increased** between 2000 and 2001, **from 27.5% to 27.8%.**

Multiple Births

The percentage of multiple births (twins, triplets, and higher order) continues to increase; 4.4% of births in 2001 were multiples, compared with 4.3% in 2000. This percentage has risen steadily since 1990 (2.6%). The increase between 2000 and 2001 is mostly attributable to mothers ages 35 and over, but there was also a small increase among mothers under age 35. The percentage of multiples among births to mothers ages 35+ (7.0%) is almost double the percentage for mothers under age 35 (3.7%).

Comparison of Massachusetts and U.S. Indicators

Massachusetts perinatal health indicators in 2001 were generally better than those for the U.S. in 2001.

According to final U.S. birth statistics for 2001 and preliminary U.S. death statistics for 2001, comparisons were as follows:

- The **birth rate** for women ages 15-44 in Massachusetts (56.8) was **15% lower** than the U.S. birth rate (66.9).
- The **infant mortality rate (IMR)** in Massachusetts (5.0) was **28% lower** than the U.S. IMR (6.9).
- The **teen birth rate** in Massachusetts (24.3) was **47% lower** than the U.S. teen birth rate (45.8).
- The **low birthweight** rate in Massachusetts (7.2%) was **7% lower** than the U.S. low birthweight rate (7.7%).
- The **percentage of women receiving prenatal care in the first trimester** in Massachusetts (84.3%) **was slightly higher** than the U.S. percentage (83.4%).

Comparison of Massachusetts and U.S. Indicators **(cont.)**

- The **cesarean section delivery rate** in Massachusetts (25.6%) was **5% higher** than the U.S. c-section rate (24.4%).

Special Notes on this Year's Publication

Additions: This year's publication adds a focus on adequacy of prenatal care. Three new tables (18-20) and a revised Figure 13 in Chapter 5 provide detailed data on adequacy of prenatal care in Massachusetts using the newly implemented Adequacy of Prenatal Care Utilization Index. In addition, this year's publication includes a new chapter (Chap. 2) on teen births in Massachusetts, in place of the annual supplement published in previous years.

Birth Data Availability

Detailed information on 2001 births in Massachusetts is also available on the Department's free, Internet-based public health information service, **MassCHIP**. To register as a user, visit the MassCHIP website at http://masschip.state.ma.us or call 1-888-MASCHIP (within MA only) or (617) 624-5541. This report is available on the DPH website at: http://www.state.ma.us/dph/pubstats.htm.

CHAPTER 1

BIRTH CHARACTERISTICS

Birth Numbers and Rates

In 2001, 81,014 births occurred to Massachusetts residents (Table 1). The number of resident live births in Massachusetts has decreased by 12% since 1990 (92,461 births).

In 2001, the birth rate was 56.8 births per 1,000 women ages 15-44 years. In the past decade, this rate decreased by 12% from 1990 to 1996, increased by 5% from 1996 to 2000, and decreased by less than 1% from 2000 to 2001 (Table 1).

The Massachusetts birth rate in 2001 was 15% below the U.S. birth rate of 66.9 per 1,000 women ages 15-44 (National Vital Statistics Reports, Vol. 51, No. 2, December 18, 2002, p.5).

Distribution of Births by Race and Hispanic Ethnicity, and Mother's Birthplace

In 2001, of all live births to Massachusetts residents, 73.0% (59,115) were to White non-Hispanic mothers; 11.6% (9,410) were to Hispanic mothers; 7.2% (5,862) were to Black non-Hispanic mothers; and 5.9% (4,784) were to Asian mothers (Table 2A).

The racial diversity of mothers in Massachusetts has increased. From 1990 to 2001, the percentage of births to white women decreased from 87.4 to 84.8, while the percentage of births to mothers of Asian or other races increased from 4.0 to 6.5. The percentage of births to black mothers fluctuated during the 1990s, decreasing from 8.3 in 1990 to 7.4 in 1996, and increasing back to 8.1 by 2001 (Table 1).

In 2001, 25% of births in Massachusetts were to women born outside of the continental United States. The percentage of non-U.S.-born (born outside of the U.S. states, Puerto Rico, and U.S. territories) mothers varied by race: 91% of Asian births were to non-U.S.-born women; 45% of Hispanic births were to non-U.S.-born women, and another 23% were to women born in Puerto Rico or other U.S. Territories; and 45% of Black non-Hispanic births were to women who were non-U.S.-born.

Teen Births

In 2001, there were 4,979 births to women ages 15-19, compared with 5,305 births for this age group in 2000 (Table 1). The number of teen births has steadily decreased since 1990, with an overall decrease of 31% (7,258 teen births in 1990).

The teen birth rate (births per 1,000 women ages 15-19) was 24.3 in 2001, a decrease of 6% from 2000 (25.8) (Table 1). In contrast, the 2001 U.S. teen birth rate was 45.8 (National Vital Statistics Report Vol. 51, No. 2, Dec. 18, 2002, p. 3). The Massachusetts 2001 teen birth rate was 47% below the U.S. teen birth rate.

Teen birth rates in Massachusetts have been steadily decreasing since 1990. The teen birth rate in Massachusetts decreased by 31% from 1990 to 2001 (Table 1).

Statewide, in 2001, 2.1% of births were to women under age 18, and 6.2% were to women under the age of 20 (Table 2A). The percentage of births to teenagers varied by race and ethnicity, partially reflecting differences in the percentage of teenage women within each racial/ethnic population group. The highest percentage of births to women under 18 was for

Hispanics (7.1%), followed by non-Hispanic blacks (4.1%), Asians (1.8%), and non-Hispanic whites (1.1%) (Table 2A).

In maternal ancestry categories, Puerto Ricans and Cambodians had the highest teen birth percentages in 2001. For Puerto Rican women, 25% of births were to women under age 20, and 11% to women under age 18 (Table 2B). For Cambodians, these percentages were 21% and 8%, respectively.

Low Birthweight

In 2001, 7.2% of infants born to Massachusetts women were low birthweight – weighing less than 2,500 grams or 5.5 pounds (Table 1). This percentage increased slightly, from 7.1% in 2000.

In 2001, the low birthweight rate in Massachusetts was 8% below the national figure of 7.7%. The percentage of low birthweight births increased nationwide from 2000 to 2001, from 7.6% to 7.7% (National Vital Statistics Reports, Vol. 51, No. 2, December 18, 2002, p. 18).

The percentage of low birthweight infants varied by mother's race and ethnicity. Non-Hispanic black mothers had the highest proportion of low birthweight infants: 11.2%; followed by Hispanic mothers: 8.2%; Asian mothers: 7.3%; and non-Hispanic white mothers: 6.6% (Table 2A). The low birthweight percentage for non-Hispanic black mothers decreased by 7% from 12.0% in 2000 to 11.2% in 2001, while percentages remained constant for other race groups.

In maternal ancestry categories, the highest percentages of low birthweight in 2001 occurred among mothers who identified their ancestries as Cambodian (11.5%), African-American (11.3%), West Indian/Caribbean (11.2%), and Puerto Rican (10.1%). The highest percentages of very low birthweight (less than 1,500 grams or 3.3 pounds), occurred among mothers who identified their ancestry as: West Indian/Caribbean (4.2%), Haitian (3.4%), African (2.7%), and African-American (2.6%) (Table 2B).

Prenatal Care

SPECIAL NOTE ON MEASURING ADEQUACY OF PRENATAL CARE: Beginning with *Massachusetts Births 2001*, adequacy of prenatal care is being measured by the Adequacy of Prenatal Care Utilization (APNCU) Index instead of the Kessner Index, which has been used in past reports. It improves upon the Kessner Index in various ways, the most important being the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to insufficient prenatal care visits.

Table 1 provides a comparison of values based on the two indices between 1996 and 2001. The values for the APNCU Index are consistently higher than those calculated with the Kessner Index. (Table 1). Please see the Technical Appendix for more information on the change from the Kessner Index to the APNCU Index. Please note: adequacy of prenatal care is a measure of the timing and number of prenatal care visits, and does not reflect the quality of care.

In 2001, out of all Massachusetts resident live births, 85.2% of mothers received adequate prenatal care, increasing from 83.3% in 2000 (Table 1).

In 2001, 84.3% of women received prenatal care during the first trimester of pregnancy.

The percentage of adequate prenatal care varied by mother's race and Hispanic ethnicity, ranging from 74.0% for non-Hispanic black mothers to 88.2% for non-Hispanic white mothers. The rates for Hispanic and Asian mothers were 77.0% and 81.4%, respectively (Table 2A).

Adequacy of prenatal care also varied by maternal ancestry category. Mothers reporting their ancestries as Chinese and European were the groups most likely to receive adequate prenatal care – 88.0% and 87.9%, respectively, while Cambodian and Cape Verdean mothers were least likely to receive adequate prenatal care -- 60.9% and 66.5%, respectively (Table 2B).

Cesarean Section Deliveries

In 2001, 25.6% of births to resident Massachusetts women were delivered by Cesarean section (Table 2A). The Cesarean section rate increased by 8% from 2000 (23.8%) to 2001 (25.6%), and increased 6% from 1999 (22.4%) to 2000. The C-section rate in Massachusetts in 2001 was higher than the nationwide rate of 24.4% (National Vital Statistics Reports, Vol. 51, No. 2, December 18, 2002, p.3).

Non-Hispanic black women had the highest percentage of Cesarean section deliveries, at 27.5%, and Hispanic women had the lowest percentage, at 21.9% (Table 2A). With regard to maternal ancestry, the highest percentage of Cesarean section deliveries occurred among Brazilian women (37.8%) and the lowest percentage among Cambodian women (13.3%) (Table 2B).

Breastfeeding

In 2001, 75.3% of Massachusetts mothers reported that they were breastfeeding or intending to breastfeed their infants (Table 2A). This represents a 33% increase since 1990 (56.6%, data not shown).

The percentage of mothers breastfeeding differed slightly by maternal race and Hispanic ethnicity, with the highest percentage reported among Asians (79.8%) and the lowest among non-Hispanic whites (74.3%) (Table 2A). There was more variation among mothers of different self-identified ancestry groups. The highest rates of breastfeeding were among Asian Indians (96.5%), Brazilians (94.0%), and Salvadorans (93.6%) (Table 2B). In contrast, only 50.9% of Cambodians and 51.3% of women identifying themselves as "Other Portuguese" reported that they were breastfeeding or intending to breastfeed their infants.

The percentage of mothers breastfeeding or intending to breastfeed increased as mother's age increased. For teens 15-19, the percentage was 61.8%, while for women ages 45 and above the percentage was highest, at 84.4% (Figure 2).

Birth Characteristics in the 30 Largest Massachusetts Cities and Towns

In 2001, among live births to residents of the 30 largest municipalities in the Commonwealth:

Crude birth rates (number of births per 1,000 population) were highest in Lawrence (20.9), Lowell (16.5), Brockton (16.5), and Lynn (16.1). Crude birth rates were lowest in Cambridge (9.8) and Newton (9.9) (Table 3A).

Four communities (Waltham, Springfield, New Bedford, and Peabody) recorded low birthweight percentages that were at least 25% higher than the statewide average of 7.2% (Table 3A).

Over 90% of mothers living in Arlington, Brookline, Framingham, Newton and Weymouth received adequate prenatal care. In contrast, fewer than 70% of mothers living in Pittsfield (53.6%) and Lowell (66.8%) received adequate prenatal care (Table 3A).

The birth rate for teens was highest in Lawrence (95.2 births per 1,000 females ages 15 to 19 years) and in Springfield (71.4). These two communities had rates approximately three times the statewide rate of 24.3. (Table 3A).

Three communities had 2001 infant mortality rates in excess of 10 deaths per 1,000 live births: Lawrence (11.3), Taunton (11.2), and Pittsfield (10.2). Infant mortality rates should be interpreted with caution in these communities since they are based on a small number of infant deaths (Lawrence: 17; Taunton: 9; Pittsfield: 5) (Table 3A).

Based on a three-year infant mortality rate from 1999-2001, the communities with the highest IMRs were: Fall River (8.8), Worcester (8.7), Peabody (8.4), and Lawrence (8.1) (Table 3A).

Birth Characteristics in Community Health Network Areas

In 2001, among live resident births in the 27 Massachusetts Community Health Network Areas (CHNAs):

Two CHNAs had crude birth rates of 15 births or more per 1,000 residents: Greater Lawrence Community Health Network,15.5, and Community Partners for Health (Milford),15.2 (Table 3B).

More than 8.0% (about 15% higher than the statewide average of 7.2%) of resident births were low birthweight in four CHNAs -- Alliance for Community Health (Boston/Chelsea/Revere/Winthrop), The Community Health Connection (Springfield), Greater Brockton Community Health Network, and Greater New Bedford Health & Human Services Coalition (Table 3B).

Less than 70% of mothers received adequate prenatal care in the Community Health Network of Berkshire County (67%), while over 93% of mothers living within the Community Partners for Health (Milford) and Community Health Network of Greater Metro West (Framingham) received adequate prenatal care (Table 3B).

Teen birth rates among Greater Lawrence Community Health Network, and The Community Health Connection (Springfield) were the highest in the state, approximately double the statewide teen birth rate, while rates were four times lower than the statewide average for West

Suburban Health Network (Newton/Waltham) and Greater Woburn/Concord/Littleton Community Health Network (Table 3B).

Partners for a Healthier Community (Fall River) had the highest infant mortality rate in 2001: 7.9 deaths per 1,000 live births. Because of the relatively small number of infant deaths, mortality rates in individual CHNAs should be interpreted with caution (Table 3B).

Tobacco Use

In 2001, 9.1% of births were to mothers who reported smoking cigarettes during their pregnancies (Fig. 3). This represents a 53% decline from 1990 (19.3%, data not shown), and a decline of 6% from the previous year, 2000 (9.7%, data not shown).

Smoking prevalence during pregnancy differed by mother's race and Hispanic ethnicity. Non-Hispanic white women had the highest prevalence of smoking during pregnancy (10.1%), followed by non-Hispanic black women (8.3%), Hispanic women (7.4%), and, finally, Asian women (1.5%) (Fig. 3).

The prevalence of smoking during pregnancy decreased with increasing education level of the mother; over 20% of mothers with less than a high school education smoked during pregnancy, compared with less than 1% of women with post-college education (Fig. 3). This was true for all race groups; however, there were larger differences in smoking prevalence between education levels for White non-Hispanics than for other groups.

The majority (84.0%) of women who gave birth in 2001 were non-smokers prior to pregnancy, and 99.9% of them continued to abstain from smoking during pregnancy (Fig. 4). (Sixty-eight women started smoking during pregnancy.) Out of the16% of women who smoked prior to pregnancy, about half of them were "light" smokers (1-10 cigarettes daily); 43% were "moderate" smokers (11-20 cigarettes daily); and 6% were "heavy" smokers (21 or more cigarettes daily). Almost half (44%) of pre-pregnancy smokers quit smoking during pregnancy (data not shown).

Patterns in Number and Rate of Births by Age Group

There has been a marked change in the age distribution of Massachusetts resident mothers since 1980. Approximately 25% of women giving birth were ages 30 years and older in 1980 as compared to 55% in 2001. Beginning in 1996, the number of births to mothers ages 30 years and older exceeded the number of births to mothers under age 30. This trend has continued through 2001 (Fig. 1).

In Massachusetts, the birth rate (births to women ages 15-44 years per 1,000 women ages 15-44) decreased 9% from 1990 (62.2) to 2001 (56.8) (Table 4). In 2001, the age-specific birth rates were highest for 30-34 year old (107.6 per 1,000) and 25-29 year old mothers (86.2 per 1,000). The birth rates for women ages 30 years and older have increased steadily throughout the 1990s (data not shown).

Since 1990, birth rates have increased for every age group of women ages 30 and above and decreased for every age group of women under 30 (Table 4). The largest birth rate increases

have been for mothers in the oldest age groups, while the largest decreases have been among the youngest age groups (Table 4).

In 2001, there were 78 births to mothers ages 12-14 years and there were 144 births to women 45 years of age or older (Table 4).

Plurality

Plurality represents the number of births in one delivery. In 2001, 95.6% of all births were singletons, 4.2% were twins and 0.3% were triplets or higher order multiple births. The total percentage of multiple births (twins, triplets or more) was 4.4% in 2001 (Table 6).

The percentage of multiple births out of all live births has increased by 69% since 1990 (2.6%). The increase since 1990 in the percentage of multiple births varies by age. For women under age 35 years, the percentage of multiple births increased from 2.5% in 1990 to 3.7% in 2001, an increase of 48%. The percentage of multiple births for women ages 35 years and older has increased at double that rate (100%), from 3.5% in 1990 to 7.0% in 2001 (Table 6).

Education

In 2001, 10.1% of women who gave birth had less than a high school education; 26.3% had a high school diploma or GED; 23.1% had some college education; and 40.5% had at least a college degree (Table 7).

Maternal educational attainment varied by race; 51% of Asian women and 48% of non-Hispanic white women had at least a college degree, compared with 16% of non-Hispanic black women and 10% of Hispanic women (Table 7).

Women with more education were more likely to receive adequate prenatal care; more likely to breastfeed; more likely to have multiple births; and more likely to be married. They were less likely to smoke during pregnancy and less likely to receive publicly financed prenatal care (Table 7).

Healthy People 2010 Objectives

Healthy People 2010 (HP2010) sets targets for each measurable objective. Table 8 presents the most recent Massachusetts data for HP2010 Maternal, Infant, and Child Health objectives, and measures the state's progress toward meeting the targets set for 2010.

Out of 16 objectives presented, Massachusetts has already met the 2010 target for two indicators: the postneonatal mortality rate and breastfeeding. For eight objectives, the 2001 Massachusetts indicators are within 25% of the target goals: infant mortality rate, fetal mortality rate, perinatal mortality rate, preterm, early and adequate prenatal care, prenatal care beginning in the first trimester, very low birthweight infants born at Level III hospitals, and smoking during pregnancy. For six objectives, Massachusetts is still over 25% away from achieving the targets: neonatal mortality rate, maternal mortality ratio, low birthweight, very low birthweight, and Cesarean sections (both low-risk women giving birth for the first time and for low-risk women with prior Cesarean section).

Table 1. Trends in Birth Characteristics, Massachusetts: 1980, 1985, 1990-2001

Characteristic		1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Births[1]	**n**[2]	72,591	81,781	92,461	88,176	87,202	84,627	83,758	81,562	80,164	80,321	81,406	80,866	81,582	81,014
	Rate[3]	53.4	57.5	62.1	59.4	59.1	57.6	57.0	55.5	54.6	54.7	55.6	55.9	57.2	56.8
Race of Mother															
White[4]	**n**	66,220	71,854	80,775	76,983	76,052	73,704	72,980	71,083	69,485	69,503	70,452	69,305	69,371	68,728
	%[5]	91.2	87.9	87.4	87.3	87.2	87.1	87.1	87.2	86.7	86.5	86.5	85.7	85.0	84.8
Black	**n**	4,626	5,099	7,729	7,352	7,203	6,916	6,713	6,299	5,946	6,182	6,337	6,524	6,445	6,555
	%[5]	6.4	6.2	8.3	8.3	8.3	8.2	8.0	7.7	7.4	7.7	7.8	8.1	7.9	8.1
Asian/Other[6]	**n**	1,069	1,741	3,688	3,566	3,582	3,664	3,790	3,817	3,950	4,217	4,248	4,615	5,205	5,279
	%[5]	1.5	2.1	4.0	4.0	4.1	4.3	4.5	4.7	4.9	5.3	5.2	5.7	6.4	6.5
Unknown	**n**	676	3,087	269	275	365	343	275	363	783	419	369	422	561	452
	%[5]	0.9	3.8	0.3	0.3	0.4	0.4	0.3	0.4	1.0	0.5	0.5	0.5	0.7	0.6
Teen Births	**n**	7,694	6,859	7,258	6,892	6,555	6,469	6,412	5,990	5,758	5,801	5,823	5,515	5,305	4,979
(Ages 15-19)	**Rate**[3]	28.1	28.7	35.4	35.4	34.5	34.0	33.2	30.3	28.5	28.5	28.1	26.7	25.8	24.3
Births to Unmarried Mothers	**n**	11,356	15,044	22,837	22,852	22,612	22,345	22,302	20,857	20,253	20,640	21,191	21,448	21,621	21,620
	%	15.6	18.4	24.7	25.9	25.9	26.4	26.6	25.6	25.3	25.7	26.0	26.5	26.5	26.7
Low Birthweight	**n**	4,413	4,751	5,388	5,199	5,137	5,202	5,335	5,174	5,105	5,617	5,655	5,708	5,711	5,795
	%	6.1	5.8	5.8	5.9	5.9	6.2	6.4	6.4	6.4	7.0	7.0	7.1	7.1	7.2
Preterm	**n**			6,732	6,009	6,313	6,201	6,492	6,438	5,705	5,831	6,117	6,136	6,582	6,412
	%			7.4	6.8	7.3	7.4	7.8	7.9	7.2	7.3	7.6	7.6	8.3	8.0
Adequate Prenatal Care															
Kessner Index[7]	**%**	82.0	79.4	80.1	81.6	82.9	83.8	84.3	84.2	79.9	80.0	79.8	79.4	79.1	80.4
APNCU Index[8]	**%**									83.3	82.9	82.9	82.9	83.3	85.2

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Births presented in all tables are resident live births unless otherwise specified. 2. Differences in numbers of births from previous publications are the result of updated files. 3. Birth rates represent the total number of births to women ages 15-44 years per 1,000 females ages 15-44; teen birth rates refer to number of births per 1,000 women age 15-19. 2000 and 2001 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts. 1999 rates are calculated using the 1999 DPH Massachusetts population estimates (see Technical Notes in Appendix). PLEASE NOTE: DIFFERENCES BETWEEN THESE RATES AND PREVIOUSLY PUBLISHED DATA REFLECT UPDATES IN POPULATION ESTIMATES. 4. On tables and graphs that include data prior to June 1986, the race classifications do not include an ethnicity component; most Hispanics are included in the race category of white. 5. Percentages are calculated based on all births, including those to mothers of unknown race. 6. Other races include American Indian and others not specified. 7. Adequacy of prenatal care in Massachusetts has historically been measured with the Kessner Index, based on the timing of care and number of visits. This measure is calculated based on only those births with known adequacy of prenatal care. Changes in the calculation of the Kessner Index in 1996, as well as computational adjustments made for 1996-2000 data, make data prior to 1996 non-comparable to data from 1996 onward. 8. Beginning with this year's publication, the APNCU Index has replaced the Kessner Index as the standard measurement of adequacy of prenatal care (see Technical Notes for more information).

Table 2A. Birth Characteristics by Maternal Race/Hispanic Ethnicity and Birthplace, Massachusetts: 2001

Race and Hispanic Ethnicity (by mother's birthplace)	Births[1]		Teen Births				Birthweight				Prenatal Care				Cesarean Section		Breastfeeding[5]	
			<18 Years		<20 Years		Very Low[2]		Low[3]		Adequate[4]		First Trimester					
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
State Total	**81,014**	**100.0**	**1,705**	**2.1**	**5,057**	**6.2**	**1,114**	**1.4**	**5,795**	**7.2**	**68,481**	**85.2**	**67,821**	**84.3**	**20,639**	**25.6**	**59,911**	**75.3**
U.S. States / D.C.	60,746	75.0	1,255	2.1	3,760	6.2	816	1.3	4,302	7.1	52,531	87.1	52,338	86.8	15,657	25.9	42,812	72.0
Puerto Rico/U.S. Terr.[7]	2,258	2.8	205	9.1	490	21.7	53	2.4	219	9.7	1,736	77.4	1,677	74.8	507	22.5	1,576	70.1
Non-U.S.-Born[8]	17,916	22.1	244	1.4	804	4.5	234	1.3	1,251	7.0	14,139	79.6	13,730	77.1	4,454	24.9	15,519	87.0
Non-Hispanic White	**59,115**	**73.0**	**634**	**1.1**	**2,335**	**4.0**	**690**	**1.2**	**3,883**	**6.6**	**51,810**	**88.2**	**51,723**	**88.0**	**15,456**	**26.2**	**42,978**	**74.3**
U.S. States / D.C.	53,345	90.2	606	1.1	2,189	4.1	637	1.2	3,527	6.6	46,965	88.6	46,967	88.5	13,971	26.3	37,972	72.8
Puerto Rico/U.S. Terr.[7]	47	0.1	2	--[6]	4	--[6]	1	--[6]	6	12.8	36	76.6	40	85.1	8	17.0	35	81.4
Non-U.S.-Born[8]	5,661	9.6	26	0.5	141	2.5	45	0.8	335	5.9	4,757	84.6	4,666	82.9	1,463	25.9	4,967	88.3
Non-Hispanic Black	**5,862**	**7.2**	**240**	**4.1**	**636**	**10.8**	**188**	**3.2**	**654**	**11.2**	**4,276**	**74.0**	**4,136**	**71.2**	**1,607**	**27.5**	**4,416**	**75.8**
U.S. States / D.C.	3,217	54.9	210	6.5	550	17.1	96	3.0	393	12.3	2,365	74.5	2,269	71.2	815	25.4	2,069	64.8
Puerto Rico/U.S. Terr.[7]	19	0.3	1	--[6]	1	--[6]	4	--[6]	6	31.6	16	84.2	15	78.9	5	26.3	14	77.8
Non-U.S.-Born[8]	2,618	44.7	29	1.1	84	3.2	87	3.3	252	9.6	1,889	73.2	1,845	71.2	784	30.0	2,333	89.2
Hispanic	**9,410**	**11.6**	**671**	**7.1**	**1,653**	**17.6**	**161**	**1.7**	**775**	**8.2**	**7,203**	**77.0**	**6,939**	**74.1**	**2,063**	**21.9**	**7,336**	**78.1**
U.S. States / D.C.	2,989	31.8	341	11.4	786	26.3	63	2.1	296	9.9	2,297	77.2	2,220	74.6	608	20.4	1,947	65.4
Puerto Rico/U.S. Terr.[7]	2,184	23.2	202	9.2	483	22.1	48	2.2	207	9.5	1,680	77.4	1,619	74.5	492	22.5	1,524	69.9
Non-U.S.-Born[8]	4,237	45.0	128	3.0	384	9.1	50	1.2	272	6.4	3,226	76.7	3,100	73.4	963	22.8	3,865	91.3
Asian	**4,784**	**5.9**	**85**	**1.8**	**221**	**4.6**	**52**	**1.1**	**348**	**7.3**	**3,879**	**81.4**	**3,716**	**77.9**	**1,055**	**22.1**	**3,794**	**79.8**
U.S. States / D.C.	432	9.0	40	9.3	88	20.4	8	1.9	30	6.9	346	80.1	329	76.2	95	22.0	355	82.6
Puerto Rico/U.S. Terr.[7]	1	--[6]	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	--[6]
Non-U.S.-Born[8]	4,333	90.6	44	1.0	132	3.0	42	1.0	314	7.3	3,517	81.5	3,370	78.1	958	22.2	3,438	79.5
Other[9]	**1,698**	**2.1**	**71**	**4.2**	**201**	**11.8**	**18**	**1.1**	**127**	**7.5**	**1,256**	**75.3**	**1,254**	**74.9**	**435**	**25.7**	**1,341**	**80.1**
U.S. States / D.C.	648	38.2	55	8.5	139	21.5	9	1.4	50	7.7	512	80.3	510	79.8	153	23.7	432	67.2
Puerto Rico/U.S. Terr.[7]	4	--[6]	0	0.0	0	0.0	0	0.0	0	0.0	4	--[6]	3	--[6]	2	--[6]	2	--[6]
Non-U.S.-Born[8]	1,044	61.5	16	1.5	62	5.9	9	0.9	77	7.4	739	72.1	740	71.8	280	26.9	907	88.2
Unknown[10]	**145**	**0.2**	**4**	--[6]	**11**	**7.6**	**5**	**7.2**	**8**	**11.6**	**57**	**90.5**	**53**	**82.8**	**23**	**33.8**	**46**	**83.6**

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the first category, "Births", percentages of race/Hispanic ethnicity are based on state total of births (including births of unknown race/ethnicity), percentages of mother's birthplace categories are based on subtotals of each race/Hispanic ethnicity category. For all other categories, percentages are based on row totals. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low birthweight: less than 2,500 grams or 5.5 pounds. 4. Beginning with this year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 5. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed. 6. Calculations based on fewer than five events are excluded. 7. The category "Puerto Rico/U.S. Territories" includes women born in Puerto Rico, the U.S. Virgin Islands, and Guam. Approximately 95% of the births in this category were to women born in Puerto Rico. 8. The category "Non-U.S.-Born" includes women born outside of the 50 U.S. states, District of Columbia, and Puerto Rico/U.S. territories. 9. Other: Mothers who designated themselves as American Indian or Other race. 10. Unknown: Mothers who did not indicate a race/ethnicity.

Table 2B. Birth Characteristics by Maternal Ancestry, Massachusetts: 2001

Maternal Ancestry	Births[1]		Teen Births				Birthweight				Prenatal Care				Cesarean Section		Breastfeeding[5]	
			<18 Years		<20 Years		Very Low[2]		Low[3]		Adequate[4]		1st Trimester					
	n	%[5]	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
State Total	**81,014**	**100.0**	**1,705**	**2.1**	**5,057**	**6.2**	**1,114**	**1.4**	**5,795**	**7.2**	**68,481**	**85.2**	**67,821**	**84.3**	**20,639**	**25.6**	**59,911**	**75.3**
Puerto Rican	4,532	5.6	478	10.5	1,125	24.8	99	2.2	456	10.1	3,459	76.7	3,315	73.5	984	21.7	2,979	65.8
Dominican	1,619	2.0	79	4.9	217	13.4	31	1.9	122	7.5	1,243	77.1	1,228	76.1	414	25.6	1,424	88.1
Salvadoran	799	1.0	28	3.5	88	11.0	11	1.4	52	6.5	580	73.7	548	68.8	117	14.6	748	93.6
Other Central American	849	1.0	32	3.8	85	10.0	6	0.7	48	5.7	636	75.4	608	71.9	157	18.5	768	90.7
Other Hispanic[7]	1,611	2.0	54	3.4	138	8.6	14	0.9	97	6.0	1,285	80.3	1,240	77.5	391	24.3	1,417	88.4
Chinese	1,254	1.5	7	0.6	14	1.1	8	0.6	71	5.7	1,100	88.0	1,045	83.6	283	22.6	1,039	83.2
Vietnamese	764	0.9	10	1.3	34	4.5	5	0.7	50	6.5	638	83.8	608	79.8	153	20.0	479	62.7
Cambodian	593	0.7	50	8.4	125	21.1	13	2.2	68	11.5	358	60.9	320	54.2	79	13.3	302	50.9
Asian Indian	948	1.2	0	0.0	1	--[6]	11	1.2	83	8.8	785	83.2	783	83.0	288	30.5	910	96.5
Other Asian/PI[8]	1,293	1.6	18	1.4	49	3.8	14	1.1	81	6.3	1,053	81.6	1,014	78.6	280	21.7	1,127	87.4
Cape Verdean	814	1.0	42	5.2	111	13.6	9	1.1	69	8.5	532	66.5	517	64.1	215	26.5	600	73.9
Brazilian	1,282	1.6	19	1.5	86	6.7	16	1.2	87	6.8	1,046	81.9	1,036	81.1	484	37.8	1,205	94.0
Other Portuguese	1,394	1.7	30	2.2	112	8.0	8	0.6	80	5.8	1,198	86.4	1,162	83.7	326	23.5	712	51.3
Haitian	1,026	1.3	10	1.0	25	2.4	35	3.4	96	9.4	691	68.6	680	66.9	329	32.2	895	87.2
W. Indian /Carib.[9]	689	0.9	14	2.0	38	5.5	29	4.2	77	11.2	535	78.6	512	75.1	181	26.3	607	88.1
African-American	2,775	3.4	179	6.5	479	17.3	71	2.6	312	11.3	2,029	74.1	1,955	71.0	678	24.5	1,803	65.1
African[10]	950	1.2	8	0.8	28	2.9	26	2.7	86	9.1	715	75.9	692	73.5	284	29.9	857	90.2
Middle Easterner[11]	952	1.2	3	--[6]	21	2.2	8	0.8	71	7.5	784	82.6	787	82.9	230	24.3	839	88.2
Native American	260	0.3	10	3.8	35	13.5	4	--[6]	14	5.4	199	78.0	198	77.3	65	25.2	177	68.9
European	15,013	18.5	68	0.5	295	2.0	113	0.8	792	5.3	13,115	87.9	13,026	87.3	3,900	26.1	12,116	81.8

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the first category, "Births", percentages are based on column total (state total of births, including births for which maternal ancestry is unknown). For all other categories, percentages are based on row totals. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low birthweight: less than 2,500 grams or 5.5 pounds. 4. Beginning with this year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 5. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed. 6. Calculations based on fewer than five events are excluded. 7. Other Hispanic includes Mexican, Cuban, Colombian, and Other South American. 8. Other Asian and Pacific Islander includes Korean, Filipino, Japanese, Laotian, Thai, Pakistani and Hawaiian. 9. West Indian and Caribbean include Jamaican and Barbadian. 10. African includes Nigerian and other African. 11. Middle Easterner includes Lebanese, Iranian, and Israeli.

Table 3A. Resident Birth Characteristics, 30 Largest Municipalities[1], Massachusetts: 2001

Municipality	Rank (by pop. size)	Population	Crude Birth Rate[2]	Mother's Race and Ethnicity				Very Low Birthweight (<1500 g)	Low Birthweight (<2500 g)
				Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian or Other[4]		
				%[3]	%[3]	%[3]	%[3]	%	%
STATE TOTAL		6,349,097	12.8	73.0	7.2	11.6	8.0	1.4	7.2
Arlington	29	42,389	13.7	85.9	1.2	2.2	10.5	2.1	8.3
Attleboro	30	42,068	14.9	85.1	1.9	4.8	7.8	2.6	8.8
Barnstable	25	47,821	10.3	84.2	3.6	4.5	7.5	1.6	6.3
Boston	1	589,141	14.0	36.0	30.5	21.7	11.5	2.0	8.6
Brockton	6	94,304	16.5	44.0	29.5	9.0	17.5	1.9	8.8
Brookline	17	57,107	10.5	74.5	2.8	3.5	19.0	--[5]	6.4
Cambridge	5	101,355	9.8	57.6	15.1	9.2	17.9	0.6	6.7
Chicopee	21	54,653	10.6	78.2	2.6	17.0	2.2	--[5]	8.5
Fall River	8	91,938	13.3	83.3	5.9	6.2	4.3	1.4	8.1
Framingham	14	66,910	15.1	69.1	6.2	14.9	9.8	1.8	8.0
Haverhill	16	58,969	15.3	82.4	2.1	11.5	3.4	1.2	6.0
Lawrence	13	72,043	20.9	19.8	2.2	73.8	4.1	2.7	8.2
Lowell	4	105,167	16.5	47.2	5.7	17.6	29.2	1.8	8.7
Lynn	9	89,050	16.1	42.2	12.9	31.6	13.3	1.4	7.0
Malden	18	56,340	14.1	54.6	13.0	8.4	23.8	1.6	6.5
Medford	20	55,765	11.2	76.8	9.4	3.4	10.4	1.1	6.4
Methuen	28	43,789	12.6	75.1	1.5	18.5	4.9	2.2	6.8
New Bedford	7	93,768	13.8	65.8	7.4	16.7	9.8	1.7	9.4
Newton	11	83,829	9.9	82.9	1.7	3.0	12.2	0.6	5.3
Peabody	24	48,129	12.0	85.2	1.0	6.8	6.8	1.2	9.1
Pittsfield	27	45,793	10.7	85.7	6.1	5.1	3.1	3.1	8.8
Plymouth	23	51,701	13.2	94.9	1.0	1.2	2.8	1.0	5.1
Quincy	10	88,025	12.9	66.8	4.6	2.6	25.6	1.1	6.1
Revere	26	47,283	14.2	62.4	5.1	18.4	14.2	1.9	8.2
Somerville	12	77,478	11.3	64.7	9.5	15.3	10.6	0.8	6.9
Springfield	3	152,082	15.8	31.2	21.3	43.2	4.2	1.5	9.4
Taunton	19	55,976	14.3	85.8	4.6	5.5	4.0	2.4	8.2
Waltham	15	59,226	11.6	60.8	6.6	18.7	13.7	1.2	10.0
Weymouth	22	53,988	13.0	90.1	1.6	2.4	5.9	1.6	7.3
Worcester	2	172,648	14.9	58.2	10.5	22.3	8.8	1.9	8.6

Table 3A.(cont'd) Resident Birth Characteristics, 30 Largest Municipalities[1], Massachusetts: 2001

Municipality	Birth					Deaths			
	Adequate Prenatal Care[6]	Public Payment[7] for Prenatal Care	Unmarried	Teen Mothers 15 to 19 years		Infant Mortality Rate[8]		Neonatal Mortality Rate[8]	
	%	%	%	n	Rate[2]	2001	1999-2001	2001	1999-2001
STATE TOTAL	85.2	27.8	26.7	4,979	24.3	5.0	4.9	3.8	3.8
Arlington	91.6	5.4	6.9	5	6.5	--[5]	--[5]	0.0	--[5]
Attleboro	83.7	23.1	19.4	39	33.9	--[5]	3.9	--[5]	3.9
Barnstable	88.9	33.8	26.3	36	28.0	--[5]	6.2	--[5]	4.1
Boston	82.9	47.2	42.7	702	31.6	7.4	7.2	5.5	5.7
Brockton	75.0	52.7	53.0	170	51.5	5.2	5.0	3.9	3.7
Brookline	93.1	5.9	6.3	4	--[5]	0.0	--[5]	0.0	--[5]
Cambridge	87.8	17.3	16.5	16	4.3	--[5]	3.8	0.0	1.9
Chicopee	81.3	44.2	41.7	73	40.4	--[5]	5.1	--[5]	4.5
Fall River	82.2	54.4	47.8	155	53.2	7.3	8.8	7.3	7.1
Framingham	91.2	28.6	19.9	46	23.9	8.9	6.7	8.9	6.3
Haverhill	85.3	28.9	28.6	62	34.6	--[5]	3.0	--[5]	2.6
Lawrence	73.8	67.9	63.5	271	95.2	11.3	8.1	8.0	6.2
Lowell	66.8	46.3	46.9	215	54.9	5.2	6.4	4.6	5.0
Lynn	71.7	58.4	48.8	158	52.8	5.6	6.6	4.2	4.9
Malden	85.7	30.6	22.3	28	20.1	--[5]	3.7	0.0	2.1
Medford	89.0	14.6	16.3	7	4.0	--[5]	4.3	--[5]	3.7
Methuen	82.9	25.6	28.4	49	38.8	0.0	6.0	0.0	6.0
New Bedford	78.1	59.4	50.5	185	62.1	7.7	6.2	3.9	3.4
Newton	94.1	4.3	4.2	7	2.1	--[5]	3.1	--[5]	1.9
Peabody	78.3	21.4	19.3	22	16.9	--[5]	8.4	--[5]	6.6
Pittsfield	53.6	50.3	47.5	49	36.0	10.2	4.8	--[5]	--[5]
Plymouth	84.4	16.3	16.6	20	12.7	--[5]	5.3	--[5]	2.9
Quincy	88.2	25.6	17.7	30	15.4	--[5]	3.9	--[5]	3.3
Revere	82.9	39.5	32.5	50	41.2	9.0	5.7	7.5	5.2
Somerville	82.9	33.3	28.0	42	20.1	--[5]	4.7	--[5]	4.0
Springfield	70.5	62.6	66.1	431	71.4	6.2	7.0	3.3	4.0
Taunton	83.2	30.5	32.1	63	38.1	11.2	7.2	8.7	4.6
Waltham	88.9	22.7	21.7	23	10.2	--[5]	4.4	--[5]	2.4
Weymouth	91.1	15.5	16.7	22	16.5	--[5]	3.2	--[5]	3.2
Worcester	89.8	45.4	41.7	269	38.9	8.2	8.7	6.6	6.7

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. The 30 largest municipalities are the cities and towns in Massachusetts with the largest populations according to DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 2. Crude birth rates represent the number of births per 1,000 residents; teen birth rates refer to the number of births per 1,000 females ages 15-19. 2001 birth rates are calculated using the DPH 2000 population estimates. 3. For the category of Mother's Race and Ethnicity, percentages are calculated based on the state total of resident births, including births for which mother's race/Hispanic ethnicity is unknown. 4. Mothers who designated themselves as Asian, American Indian or Other. 5. Calculations based on fewer than 5 events are excluded. 6. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary for definition. 7. Public payment sources include Commonhealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care. 8. Deaths per 1,000 live births. See Definitions of Rates section in Appendix for definitions of infant and neonatal mortality rates.

Table 3B: Resident Birth Characteristics, Community Health Network Areas (CHNAs), Massachusetts: 2001

CHNA	Population	Crude Birth Rate[1]	Mother's Race and Ethnicity: Non-Hispanic White %[3]	Non-Hispanic Black %[3]	Hispanic %[3]	Asian or Other[2] %[3]	Very Low Birthweight (<1500 g) %	Low Birthweight (<2500 g) %
STATE TOTAL	6,349,097	12.8	73.0	7.2	11.6	8.0	1.4	7.2
Community Health Network of Berkshire County	134,953	9.2	90.6	2.9	3.6	2.5	1.9	7.6
Upper Valley Health Web (Franklin County)	86,889	10.5	90.5	0.9	4.4	3.0	1.0	6.6
Partnership for Health in Hampshire County (Northampton)	150,077	8.5	87.4	1.6	5.2	5.4	1.0	5.9
The Community Health Connection (Springfield)	291,665	13.1	53.8	13.7	28.4	3.9	1.2	8.4
Community Health Network of Southern Worcester County	113,702	12.4	87.7	1.1	8.8	2.4	1.0	5.8
Community Partners for Health (Milford)	152,117	15.2	94.0	0.6	2.4	2.9	1.4	6.2
Community Health Network of Greater Metro West (Framingham)	374,478	14.0	85.0	1.8	5.6	7.6	1.5	6.9
Community Wellness Coalition (Worcester)	289,834	13.9	69.8	7.0	14.9	8.1	1.8	7.8
Fitchburg/Gardner Community Health Network	250,362	13.1	82.5	2.4	10.2	4.7	1.3	6.2
Greater Lowell Community Health Network	270,083	14.5	70.7	2.9	8.9	17.3	1.3	7.7
Greater Lawrence Community Health Network	182,025	15.5	49.7	1.6	43.6	5.0	1.9	7.2
Greater Haverhill Community Health Network	144,275	13.9	89.3	1.2	6.1	2.9	1.0	5.4
Community Health Network North (Beverly/Gloucester)	118,280	10.4	93.4	0.8	2.0	3.5	1.9	7.0
North Shore Community Health Network	278,839	12.9	69.0	6.2	17.2	7.5	1.0	7.0
Greater Woburn/Concord/Littleton Community Health Network	208,406	12.1	83.1	1.7	1.7	13.2	1.1	6.5
North Suburban Health Alliance (Medford/Malden/Melrose)	261,844	13.2	76.3	6.7	6.6	10.4	1.3	6.8
Greater Cambridge/Somerville Community Health Network	278,402	11.0	70.7	8.0	8.4	12.7	1.1	6.7
West Suburban Health Network (Newton/Waltham)	253,187	11.4	82.1	2.5	6.4	8.8	0.6	6.5
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	746,914	13.9	39.7	25.3	23.2	11.5	1.8	8.3
Blue Hills Community Health Alliance (Greater Quincy)	365,457	12.6	78.0	6.2	2.4	13.1	1.1	6.6
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	159,254	11.6	66.7	1.9	29.5	1.8	1.0	7.8
Greater Brockton Community Health Network	232,260	13.8	68.8	15.9	4.9	10.3	2.0	8.3
South Shore Community Partners in Prevention (Plymouth)	180,609	13.7	96.2	0.7	1.0	1.9	1.0	6.0
Greater Attleboro-Taunton Health & Education Response	242,659	13.5	90.8	2.1	3.1	3.7	1.8	7.5
Partners for a Healthier Community (Fall River)	140,256	11.7	86.9	4.5	4.7	3.7	1.2	7.5
Greater New Bedford Health & Human Services Coalition	195,533	11.5	77.4	5.0	10.0	7.5	1.6	8.4
Cape and Islands Community Health Network	246,737	9.4	88.7	2.5	2.7	5.6	1.1	6.1

Table 3B.(cont'd) Resident Birth Characteristics, Community Health Network Areas (CHNAs), Massachusetts: 2001

CHNA	Births					Deaths			
	Adequate Prenatal Care[6]	Public Payment[7] for Prenatal Care	Unmarried	Teen Mothers 15 to 19 years		Infant Mortality Rate[8]		Neonatal Mortality Rate[8]	
	%	%	%	n	Rate[4]	2001	1999-2001	2001	1999-2001
STATE TOTAL	85.2	27.8	26.7	4,979	24.3	5.0	4.9	3.8	3.8
Community Health Network of Berkshire County	67.0	40.3	36.0	105	22.2	4.0	2.4	--[5]	--[5]
Upper Valley Health Web (Franklin County)	85.7	31.2	31.9	73	25.5	5.5	3.8	5.5	3.0
Partnership for Health in Hampshire County (Northampton)	88.8	21.2	25.1	61	6.7	3.9	4.0	--[5]	2.9
The Community Health Connection (Springfield)	76.2	47.5	48.9	506	48.1	4.7	5.4	2.9	3.3
Community Health Network of Southern Worcester County	91.1	26.0	31.7	122	33.3	4.2	5.1	--[5]	4.1
Community Partners for Health (Milford)	93.7	11.3	13.4	79	17.5	7.3	5.6	6.1	4.5
Community Health Network of Greater Metro West (Framingham)	93.1	12.5	10.5	101	10.2	5.7	4.3	5.3	3.7
Community Wellness Coalition (Worcester)	91.6	32.1	31.1	308	29.7	6.4	6.9	5.4	5.4
Fitchburg/Gardner Community Health Network	85.4	24.6	28.2	239	29.2	4.3	4.0	2.7	2.8
Greater Lowell Community Health Network	75.1	25.2	27.4	260	30.3	3.8	5.2	3.3	4.1
Greater Lawrence Community Health Network	80.0	42.6	41.1	327	52.3	6.4	6.1	4.6	5.1
Greater Haverhill Community Health Network	87.0	19.9	21.5	97	23.0	3.0	3.6	--[5]	2.9
Community Health Network North (Beverly/Gloucester)	90.2	14.7	13.8	37	9.9	6.5	3.6	5.7	3.1
North Shore Community Health Network	76.3	33.5	30.1	245	29.6	3.9	5.3	3.3	4.1
Greater Woburn/Concord/Littleton Community Health Network	88.0	5.9	7.7	26	4.8	--[5]	2.6	--[5]	2.1
North Suburban Health Alliance (Medford/Malden/Melrose)	88.1	18.8	16.1	79	11.4	3.5	3.4	2.3	2.8
Greater Cambridge/Somerville Community Health Network	88.1	18.0	16.2	71	9.0	4.9	4.5	2.6	3.3
West Suburban Health Network (Newton/Waltham)	93.0	8.2	7.9	41	4.2	2.4	2.9	--[5]	2.0
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	83.2	44.8	40.3	847	32.1	6.8	6.3	5.0	5.0
Blue Hills Community Health Alliance (Greater Quincy)	91.4	15.4	13.3	113	11.7	2.6	2.9	2.0	2.5
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	80.0	45.9	44.5	259	44.0	7.1	5.3	4.9	3.9
Greater Brockton Community Health Network	82.2	32.4	34.2	211	25.5	4.7	5.3	3.7	4.6
South Shore Community Partners in Prevention (Plymouth)	88.8	12.9	13.8	65	11.5	3.2	4.9	2.4	3.7
Greater Attleboro-Taunton Health & Education Response	85.9	20.1	20.0	166	21.8	6.7	5.3	5.5	4.1
Partners for a Healthier Community (Fall River)	84.8	47.3	42.3	188	42.3	7.9	8.7	7.3	7.2
Greater New Bedford Health & Human Services Coalition	76.7	44.7	39.4	239	36.6	7.1	5.8	3.6	3.1
Cape and Islands Community Health Network	86.2	29.8	23.7	114	18.5	6.0	6.0	4.3	4.4

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Births per 1,000 residents (male and female). 2001 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 2. Mothers who designated themselves as Asian, American Indian or Other. 3. For the category of Mother's Race and Ethnicity, percentages are calculated based on the state total of resident births, including births for which mother's race/Hispanic ethnicity is unknown. 4. Births per 1,000 female residents ages 15-19. 5. Calculations based on fewer than 5 events are excluded. 6. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary for definition. 7. Public payment sources include Commonhealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care. 8. Deaths per 1,000 live births. See Definitions of Rates section in Appendix for definitions of infant and neonatal mortality rates.

Table 4. Age-Specific and Crude Birth Rates, Massachusetts: 1990 and 2001

Mother's Age	1990 Births[1]	1990 Rate	2001 Births	2001 Rate[2]	Percent Change in Rate
12-14	124	1.3	78	0.6	-53.8
15-19	7,258	35.8	4,979	24.3	-32.1
20-24	18,115	70.5	12,029	58.5	-17.0
25-29	29,913	107.5	19,015	86.2	-19.8
30-34	25,687	92.1	26,948	107.6	16.8
35-39	9,795	40.1	14,750	53.8	34.2
40-44	1,522	6.9	3,069	11.5	66.7
45+[3]	46	0.3	144	0.6	100.0
Birth rate, ages 15-44[4]	92,290	62.2	80,790	56.8	-8.7
Crude Birth Rate[5]	92,461	15.4	81,014	12.8	-16.9

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. Differences in the number of births from previous publications are the result of updating of the birth files. The number of births for all age groups does not always add to the total number of births as mother's age is sometimes not recorded on the birth certificate. 2. 2001 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts (see Technical Notes in Appendix). 3. Denominator is female population ages 45-49. 4. Rate represents the total number of births to women age 15-44 per 1,000 women age 15 to 44. 5. Births per 1,000 residents (females and males). Includes births to mothers of all age groups and mothers for whom age is unknown.

Figure 1. Trends in the Number of Births by Mother's Age Group, Massachusetts: 1980-2001

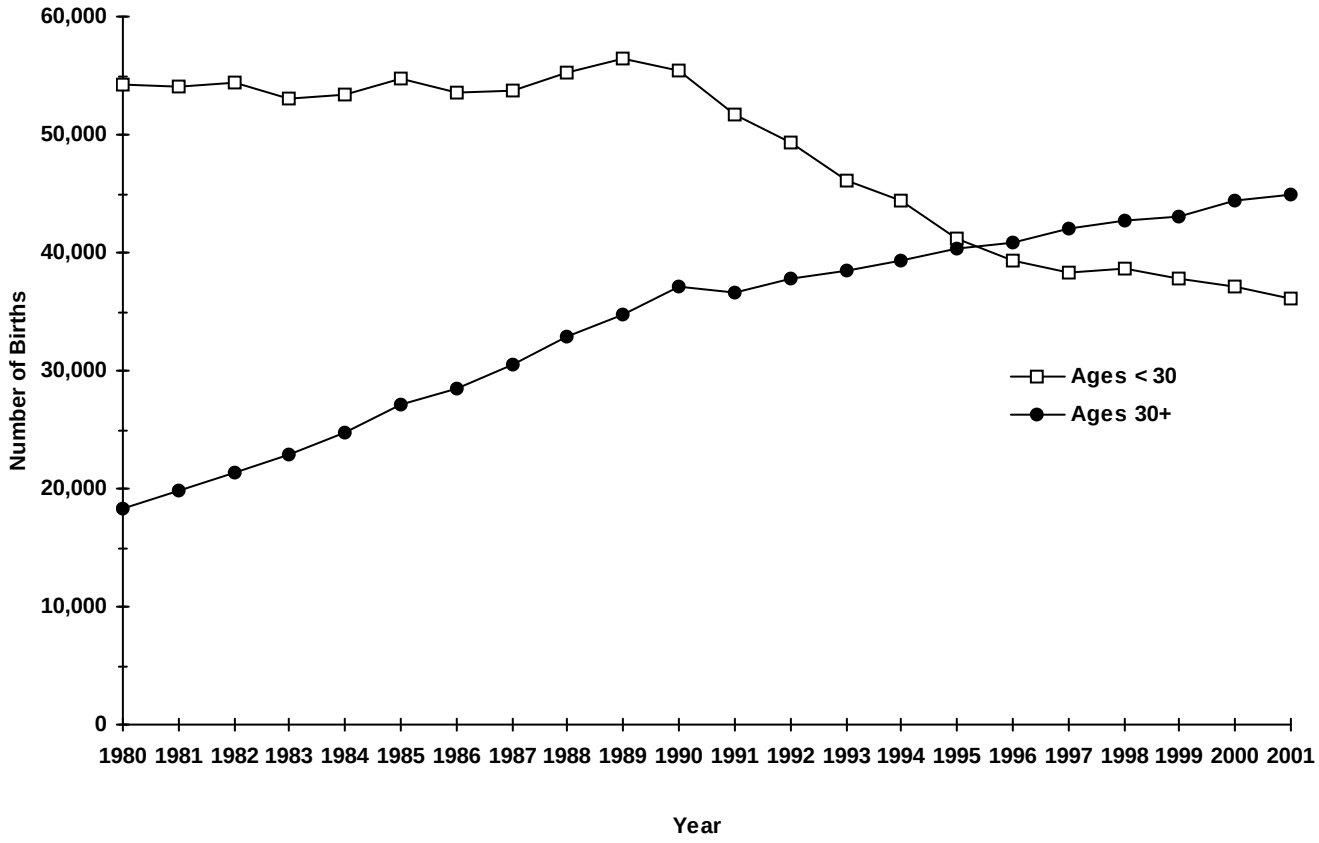
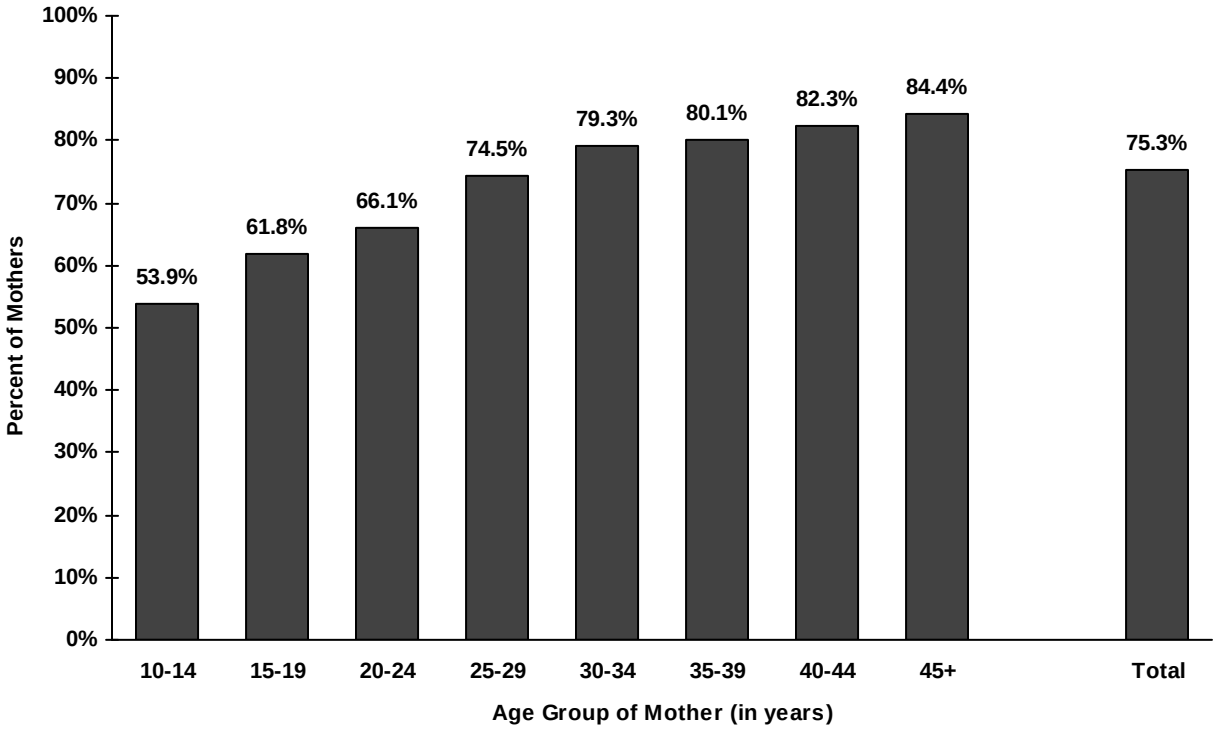


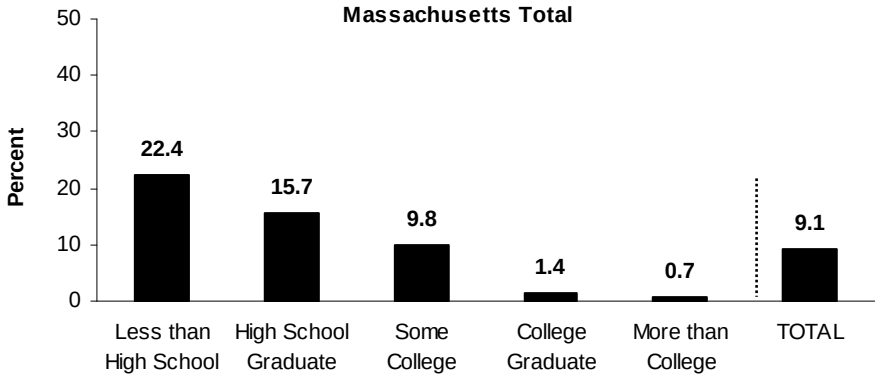
Figure 2. Percent of Mothers Breastfeeding or Intending to Breastfeed[1] by Age Group, Massachusetts [2]: 2001

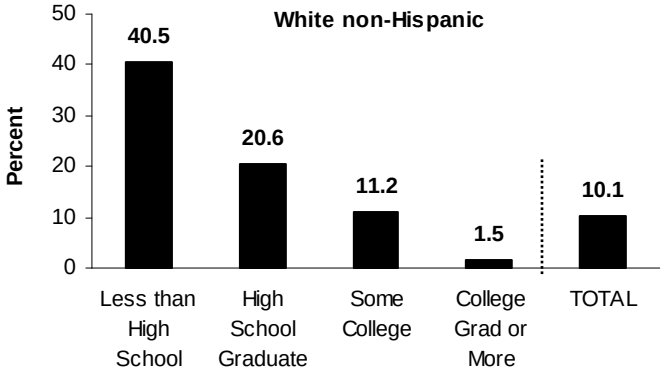


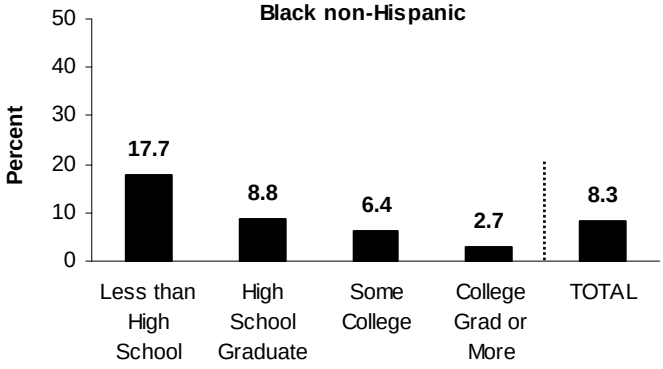
NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

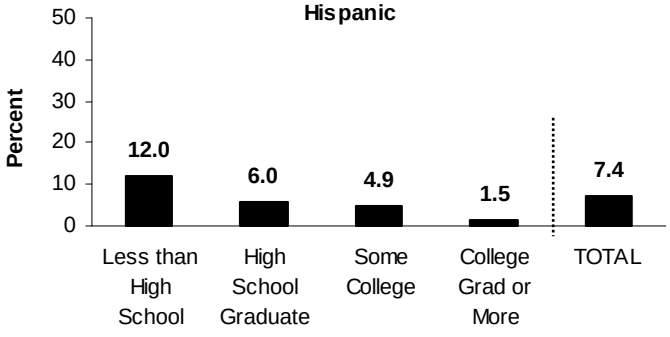
1. Information about breastfeeding was reported by the mother at the time the birth certificate was completed.
2. For race-specific breastfeeding rates see Table 2A.

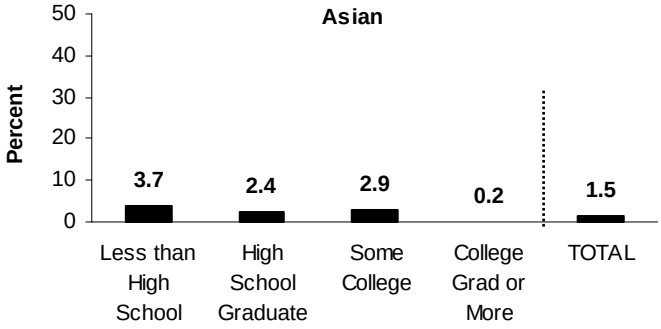
Figure 3. Percent of Mothers who Smoked During Pregnancy, by Mother's Race/Hispanic Ethnicity and Educational Attainment, Massachusetts: 2001







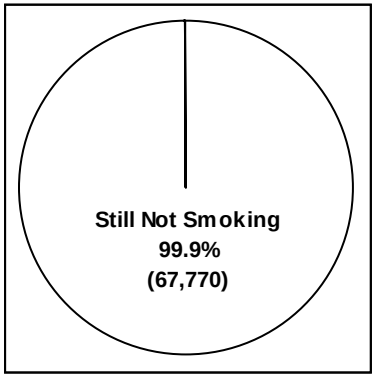
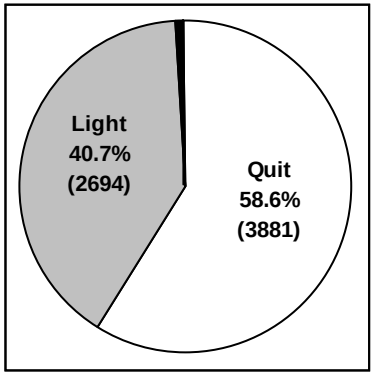
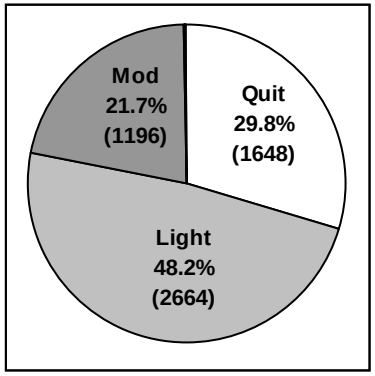
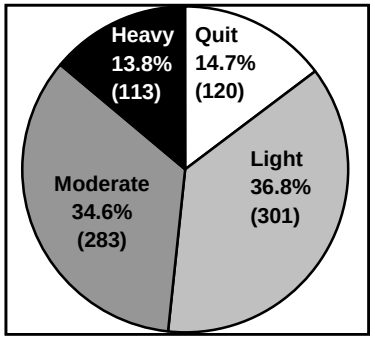




NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on information provided on the birth certificate as reported by the mother. Due to self-reported nature, data on smoking prevalence should be interpreted cautiously. Mothers with more than one delivery are counted for each birth.

Figure 4. Distribution of Smoking Status[1] during Pregnancy by Smoking Status Prior to Pregnancy, Massachusetts: 2001

Smoking Status[1] Prior to Pregnancy:	Non-Smokers 84.0% (67,838)	Light Smokers 8.2% (6,625)	Moderate Smokers 6.8% (5,525)	Heavy Smokers 1.0% (817)
Smoking Status[1] During Pregnancy:				
	99.9% of Non-Smokers continued not smoking (0.1% started smoking)	58.6% of Light Smokers quit smoking (0.8% increased)	78.0% of Moderate Smokers decreased the number of cigarettes smoked daily or quit (0.3% increased)	86.2% of Heavy Smokers decreased the number of cigarettes smoked daily or quit

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Light Smokers=1-10 cigarettes daily; Moderate Smokers=11-20 cigarettes daily; Heavy Smokers=21 cigarettes or more daily.

Table 5. Parity[1] by Age of Mother, Massachusetts: 2001

Age of Mother (years)		Total Births	1st	2nd	3rd	4th	5th+
STATE TOTAL	**n[2]**	81,014	35,032	27,971	11,927	3,873	1,945
	%[3]	100.0	43.4	34.6	14.8	4.8	2.4
10-14	**n**	78	77	1	0	0	0
	%	100.0	98.7	--[4]	0.0	0.0	0.0
15-19	**n**	4,979	4,182	666	102	13	5
	%	100.0	84.2	13.4	2.1	0.3	0.1
20-24	**n**	12,029	6,462	3,840	1,278	316	90
	%	100.0	53.9	32.0	10.7	2.6	0.8
25-29	**n**	19,015	9,003	6,301	2,450	821	370
	%	100.0	47.5	33.3	12.9	4.3	2.0
30-34	**n**	26,948	10,395	10,416	4,222	1,255	582
	%	100.0	38.7	38.8	15.7	4.7	2.2
35-39	**n**	14,750	4,038	5,615	3,239	1,165	640
	%	100.0	27.5	38.2	22.0	7.9	4.4
40-44	**n**	3,069	833	1,074	615	296	240
	%	100.0	27.2	35.1	20.1	9.7	7.8
45+	**n**	144	41	58	21	6	18
	%	100.0	28.5	40.3	14.6	4.2	12.5

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. The number of live births including this birth. 2. State totals include births of unknown parity and unknown mother's age. 3. Percents may not sum to 100.0 due to rounding. 4. Calculations based on fewer than 5 events are excluded.

Table 6. Trends in Number and Percent Distribution of Births[1] by Plurality and Age, Massachusetts: 1990-2001

Age Group	Year	Singletons n	Singletons %	Multiples[2] Twins n	Twins %	Triplets or more n	Triplets or more %	Total Multiples n	Total Multiples %	Total births n	Total births %
All Ages											
	1990	90,049	97.4	2,312	2.5	99	0.1	2,411	2.6	92,460	100.0
	1991	85,802	97.3	2,285	2.6	89	0.1	2,374	2.7	88,176	100.0
	1992	84,722	97.2	2,347	2.7	133	0.2	2,480	2.8	87,202	100.0
	1993	82,055	97.0	2,367	2.8	205	0.2	2,572	3.0	84,627	100.0
	1994	81,187	96.9	2,357	2.8	214	0.3	2,571	3.1	83,758	100.0
	1995	78,935	96.8	2,429	3.0	198	0.2	2,627	3.2	81,562	100.0
	1996	77,355	96.5	2,621	3.3	194	0.2	2,815	3.5	80,164	100.0
	1997	77,203	96.1	2,856	3.6	262	0.3	3,118	3.9	80,321	100.0
	1998	78,004	95.8	3,114	3.8	288	0.4	3,402	4.2	81,406	100.0
	1999	77,473	95.8	3,147	3.9	246	0.3	3,393	4.2	80,866	100.0
	2000	78,075	95.7	3,263	4.0	244	0.3	3,507	4.3	81,582	100.0
	2001	77,409	95.6	3,371	4.2	234	0.3	3,605	4.4	81,014	100.0
Ages <35											
	1990	79,081	97.5	1,946	2.4	70	0.1	2,016	2.5	81,097	100.0
	1991	74,810	97.5	1,863	2.4	76	0.1	1,939	2.5	76,749	100.0
	1992	73,043	97.3	1,914	2.6	103	0.1	2,017	2.7	75,060	100.0
	1993	70,042	97.2	1,849	2.6	158	0.2	2,007	2.8	72,049	100.0
	1994	68,644	97.2	1,844	2.6	164	0.2	2,008	2.8	70,652	100.0
	1995	65,669	97.2	1,787	2.6	141	0.2	1,928	2.9	67,597	100.0
	1996	63,560	96.9	1,935	2.9	126	0.2	2,061	3.1	65,621	100.0
	1997	62,598	96.7	1,949	3.0	170	0.3	2,119	3.3	64,717	100.0
	1998	62,719	96.4	2,193	3.4	170	0.3	2,363	3.6	65,082	100.0
	1999	61,816	96.4	2,147	3.3	150	0.2	2,297	3.6	64,113	100.0
	2000	61,659	96.4	2,205	3.4	130	0.2	2,335	3.6	63,994	100.0
	2001	60,704	96.3	2,211	3.5	134	0.2	2,345	3.7	63,049	100.0
Ages 35+											
	1990	10,968	96.5	366	3.2	29	0.3	395	3.5	11,363	100.0
	1991	10,987	96.2	422	3.7	13	0.1	435	3.8	11,422	100.0
	1992	11,675	96.2	433	3.6	30	0.3	463	3.8	12,138	100.0
	1993	12,007	95.5	518	4.1	47	0.4	565	4.5	12,572	100.0
	1994	12,543	95.7	513	3.9	50	0.4	563	4.3	13,106	100.0
	1995	13,264	95.0	642	4.6	57	0.4	699	5.0	13,963	100.0
	1996	13,793	94.8	686	4.7	68	0.5	754	5.2	14,547	100.0
	1997	14,602	93.6	907	5.8	92	0.6	999	6.4	15,601	100.0
	1998	15,282	93.6	921	5.6	118	0.7	1,039	6.4	16,321	100.0
	1999	15,657	93.5	1,000	6.0	96	0.6	1,096	6.5	16,753	100.0
	2000	16,412	93.3	1,058	6.0	114	0.6	1,172	6.7	17,584	100.0
	2001	16,703	93.0	1,160	6.5	100	0.6	1,260	7.0	17,963	100.0

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Differences in the number of births from previous publications are the result of updating of files. 2. Numbers of multiples (n) represent individual infants rather than sets of infants.

Table 7. Selected Birth Characteristics by Maternal Education, Massachusetts: 2001

	Less than High School		High School Graduate		Some College		College Graduate		More than College	
	n	%[1]	n	%[1]	n	%[1]	n	%[1]	n	%[1]
State Total	8,138	10.1	21,261	26.3	18,668	23.1	21,771	26.9	10,955	13.6
Race										
Non-Hispanic White	3,000	5.1	13,741	23.3	14,250	24.1	18,791	31.8	9,256	15.7
Non-Hispanic Black	863	14.7	2,199	37.6	1,846	31.5	707	12.1	240	4.1
Hispanic	3,250	34.6	3,664	39.0	1,599	17.0	618	6.6	273	2.9
Asian	675	14.1	1,006	21.1	661	13.8	1,372	28.7	1,060	22.2
Age										
20-29	3,784	12.2	11,159	36.0	8,549	27.6	5,634	18.2	1,856	6.0
30-39	1,395	3.4	7,667	18.4	9,170	22.1	15,053	36.2	8,290	19.9
40+	119	3.7	543	17.0	650	20.4	1,074	33.6	806	25.3
Non-U.S.-born[2]	2,900	35.7	5,739	27.0	3,302	17.7	3,638	16.7	2,291	20.9
Unmarried	5,912	72.7	9,363	44.0	4,753	25.5	1,182	5.4	358	3.3
Publicly-financed prenatal care	6,267	78.1	10,050	48.2	4,345	23.7	1,065	5.1	257	2.4
Very low birthweight[3]	129	1.6	382	1.8	246	1.3	243	1.1	108	1.0
Low birthweight[4]	775	9.5	1,737	8.2	1,248	6.7	1,351	6.2	664	6.1
Adequate prenatal care[5]	5,687	70.7	17,141	81.2	15,949	86.0	19,575	90.4	10,018	91.9
Cesarean section delivery	1,591	19.6	5,269	24.8	5,058	27.2	5,775	26.6	2,913	26.7
Breastfeeding[6]	4,812	59.6	13,771	65.7	13,293	72.3	18,078	85.7	9,860	90.7
Multiple births	174	2.1	788	3.7	817	4.4	1,193	5.5	629	5.7
Smoking during pregnancy	1,825	22.4	3,339	15.7	1,834	9.8	309	1.4	77	0.7

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. For state total, race and age categories, percentages are based on row totals. For all other categories, percentages are based on column totals. 2. Includes women born outside of the 50 U.S. States, Washington D.C., and Puerto Rico/U.S. territories (the U.S. Virgin Islands, and Guam). 3. Very low birthweight: less than 1,500 grams or 3.3 pounds. 4. Low birthweight: less than 2,500 grams or 5.5 pounds. 5. Beginning with this year's publication, the Adequacy of Prenatal Care Utilization Index has replaced the Kessner Index as the measure of adequate prenatal care. 6. Mother was breastfeeding or was intending to breastfeed at the time the birth certificate was completed.

Table 8. Comparison of Massachusetts Perinatal Health Indicators to Healthy People 2010 Objectives[1]

Healthy People 2010 Objectives (Focus Area 16: Maternal, Infant and Child Health[2])	HP2010 Target	Massachusetts				*Has Massachusetts achieved HP2010 target?* ✓ = YES ○ = NO, but within 25% of target ● = NO, > 25% from target
		1998	1999	2000	2001	
Fetal, Infant, and Maternal Deaths						
16-1a. Fetal Mortality Rate[3]	4.1	5.4	5.2	5.3	4.7	○
16-1b. Perinatal Mortality Rate[4]	4.5	5.9	6.0	5.4	5.6	○
16-1c. Infant Mortality Rate[5]	4.5	5.1	5.2	4.6	5.0	○
16-1d. Neonatal Mortality Rate[6]	2.9	3.9	4.1	3.5	3.8	●
16-1e. Postneonatal Mortality Rate[7]	1.2	1.2	1.1	1.1	1.2	✓
16-4. Maternal Mortality Ratio[8]	3.3	3.7	0.0	1.2	4.9	●
Risk Factors						
16-10a. Low Birthweight[9] (%)	5.0	7.0	7.1	7.1	7.2	●
16-10b. Very Low Birthweight[10] (%)	0.9	1.3	1.4	1.4	1.4	●
16-11a. Preterm[11] (%)	7.6	7.6	7.6	8.3	8.0	○
Prenatal Care						
16-6a. Care beginning in first trimester (%)	90	84.3	84.3	83.8	84.3	○
16-6b. Early and adequate care[12] (%)	90	82.9	82.9	83.3	85.2	○
Obstetrical Care						
16-8. Very Low Birthweight[10] Infants born at Level III Hospitals[13] (%)	90	80.3	82.5	83.4	79.1	○
16-9a. Cesarean Sections: Low-Risk[14] Women Giving Birth for the First Time (%)	15	17.6	18.8	20.5	22.0	●
16-9b. Cesarean Sections: Low-Risk[14] Women with Prior Cesarean Section (%)	63	63.8	68.8	72.7	79.2	●
Breastfeeding						
16-19a. Breastfeeding[15] (%)	75	70.9	72.4	73.8	75.3	✓
Prenatal Substance Exposure						
16-17c. Abstinence from Smoking (%)	99	88.5	89.3	90.3	90.9	○

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. National health promotion and disease prevention agenda established by the U.S. Dept. of Health and Human Services. 2. Goal: to improve the health and well-being of women, infants, children, and families. 3. Number of fetal deaths per 1,000 fetal deaths plus livebirths. 4. Number of fetal and infant deaths in perinatal period (from 28 weeks gestation (inclusive) to 6 days (inclusive) after birth per 1,000 fetal deaths plus livebirths. 5. Number of infant deaths (under one year of age) per 1,000 live births. 6. Number of deaths to infants less than 28 days of age per 1,000 live births. 7. Number of deaths to infants 28-364 days of age per 1,000 live births. 8. See Definition of Rates section in Appendix. 9. Less than 2,500 grams, or 5.5 pounds. 10. Less than 1,500 grams, or 3.3 pounds. 11. Born before completion of 37th week of gestation. 12. Based on Adequacy of Prenatal Care Utilization Index (see glossary). 13. Facilities for high-risk deliveries and neonates that can provide care to very small infants, including mechanical ventilation and neonatal surgery and special care for transferred patients and for which a full-time neonatologist serves as the director. 14. "Low-risk"= full term birth, singleton, vertex presentation. 15. HP2010 specifies objective as mother breastfeeding in "early postpartum period." Massachusetts data is based on mother's self-report of current breastfeeding or intention to breastfeed at the time the birth certificate is completed.

CHAPTER 2

TEEN BIRTH CHARACTERISTICS

Introduction

Massachusetts Births 2001 has been expanded this year to include a chapter that focuses on births to women ages 15-19, the "teen births". In 2001, in addition to the births to 15-19 year olds, there were 78 births to younger mothers ages 12 to 14, which represents a 7.8% decline in births in this age group from 2000 (data not shown).

Birth Numbers and Rates

In 2001, 4,979 births occurred to Massachusetts resident women ages 15-19, compared with 5,305 births for this age group in 2000 (Table 9). The number of resident live teen births in Massachusetts has decreased by 28% since 1991 (6,892 births) (Table 11).

About one-third of the teen births were to women ages 15-17 (1,627 births), and two-thirds were to women ages 18-19 (3,352 births) (Table 9).

In 2001, the teen birth rate was 24.3 births per 1,000 women ages 15-19 years, a decrease of 6% from 2000 (25.8) (Table 1). The Massachusetts teen birth rate has decreased steadily from 35.4 births per 1000 women ages 15-19 in 1990 to 24.3 in 2001 (Figure 6).

The Massachusetts teen birth rate in 2001 was 47% below the U.S. teen birth rate of 45.8 births per 1,000 women ages 15-19 (National Vital Statistics Reports, Vol. 51, No. 2, December 18, 2002, p.3) (Figure 6).

Distribution of Births by Race and Hispanic Ethnicity, and Mother's Birthplace

In 2001, of all live births to Massachusetts resident teens ages 15-19, 46.7% (2,319) were to White non-Hispanic mothers; 32.3% (1,607) were to Hispanic mothers; 12.6% (624) were to Black non-Hispanic mothers; 4.4% (219) were to Asian mothers; and 4.0% (199) were to mothers of other races (Table 9).

In 2001, the birth rates among resident teen women were in the same relative order by race and Hispanic ethnicity as they were in 1990, and they have decreased for all groups. However, Black non-Hispanics have had the greatest decrease, 48% from 1990 (89.2) to 2001 (46.0); the White non-Hispanic birth rate has decreased by 40% (from 24.0 to 14.4); the Asian teen birth rate has decreased by 39% (from 32.7 to 20.1). The Hispanic teen birth rate has declined the least at 33% (from 120.7 to 81.2) (Figure 7).

Seventy-five percent of teen births were to mothers who were born in the 50 U.S. states or D.C. Almost 10% of teen births were to mothers born in Puerto Rico or U.S. Territories. The percentage of births to non-U.S.-born teen mothers was 16% (Table 9).

Low Birthweight

In 2001, 9.8% of the infants born to women under age 20 were low birthweight – weighing less than 2,500 grams or 5.5 pounds (Figure 5) as compared to 7.0% of infants born to Massachusetts women ages 20 and older. The percentage of low birthweight infants born to teen mothers increased slightly from 2000 (9.3%) to 2001 (9.8%).

The percentage of low birthweight infants was 9% greater for teen mothers ages 18-19 (10.0%) than for mothers ages 15-17 (9.2%) (Table 9).

Prenatal Care

In 2001, of the births to women under age 20, 70.2% of the mothers received adequate prenatal care, compared with 86.2% of births to women ages 20 and over (Figure 5). (Adequacy of prenatal care is a measure of the timing and number of prenatal care visits.)

The percentage of women ages 15-17 who received inadequate prenatal care (23.3%) was 23% greater than that of women ages 18-19 (18.9%) (Table 9).

Over 75% of women under 20 years of age had their prenatal care funded by public sources, compared with 25% of women ages 20 and over (Figure 5).

Teen Birth Characteristics in the 30 Largest Massachusetts Cities and Towns

In 2001, among live births to women ages 15-19 who were residents of the 30 largest cities and towns in the Commonwealth:

Teen birth rates (number of births per 1,000 females 15-19) were highest in Lawrence (95.2), Springfield (71.4), New Bedford (62.1), Lowell (55.0), and Fall River (53.2). These communities had rates two to three times the statewide rate of 24.3.

Teen birth rates were lowest in Newton (2.1) and Medford (4.0) (Table 10). (Note: a teen birth rate was not calculated for Brookline, due to the small number of teen births. Brookline had the fewest teen births (4) of the 30 largest cities and towns in 2001.)

Eight communities (Waltham, Malden, Peabody, New Bedford, Boston, Cambridge, Methuen, and Pittsfield) recorded low birthweight percentages that were at least 25% higher than the statewide average of 9.8% (Table 10).

Over 80% of mothers ages 15-19 living in Waltham, Weymouth, Medford, Worcester, Plymouth, Cambridge, and Somerville received adequate prenatal care. In contrast, fewer than 60% of teen mothers living in Pittsfield, Attleboro, and Lowell, received adequate prenatal care (Table 10).

Tobacco Use

In 2001, over 18% of teen births were to mothers who reported smoking cigarettes during their pregnancies (Table 9).

For teen mothers ages 18-19, 20% smoked cigarettes during their pregnancies compared to 14% of mothers ages 15-17. In comparison, 9% of mothers ages 20 and over reported smoking during pregnancy.

Parity

In 2001, 84.2% of all live births to teen mothers were the mother's first live-born infant. The percentage of births that were the teen mother's second live-born infant was 13.4, and only 2.4% were the mother's third or greater live-born infants (Table 9).

As expected, mothers ages 18-19 had the greatest percentage of previous live births, almost three times more (20% v. 7%).

Plurality

Plurality represents the number of births to a woman in one delivery. In 2001, 99% of all births to mothers ages 15-19 were singletons, and 1% were twins or higher order multiple births (Table 9).

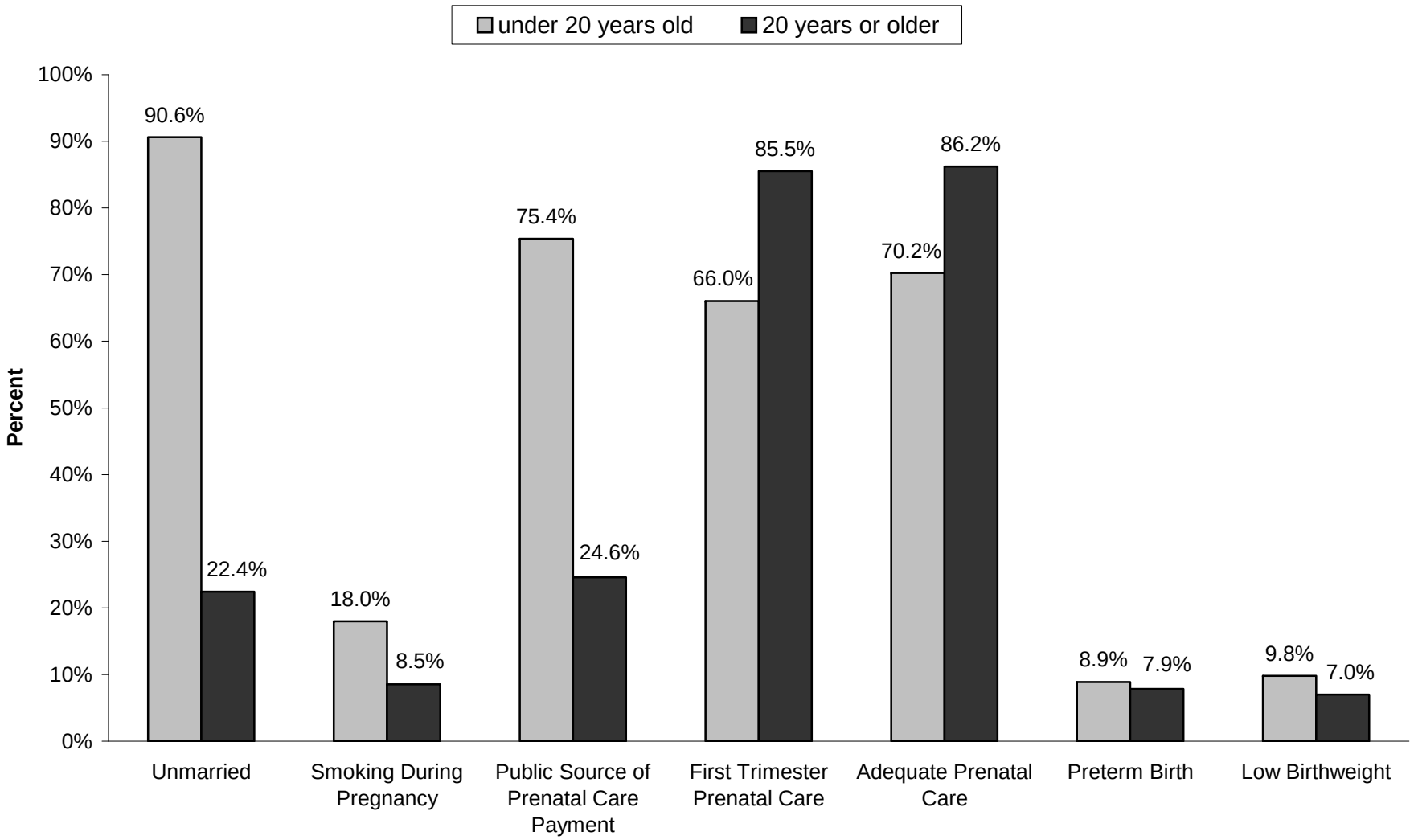
While the percentage of twins or higher order multiples was small overall, the percentage of multiple births to mothers 18-19 was almost twice that of mothers 15-17 (1.6% v. 0.9%) (Table 9).

Table 9. Summary of Selected Teen Birth Characteristics, Massachusetts: 2001

	Age 15-17		Age 18-19		Age 15-19	
	N	%[1]	N	%[1]	N	%[1]
State total	1,627	32.7%	3,352	67.3%	4,979	100.0%
	Maternal Demographics					
Race/Hispanic Ethnicity						
White non-Hispanic	618	38.1%	1,701	50.9%	2,319	46.7%
Black non-Hispanic	228	14.0%	396	11.8%	624	12.6%
Asian	83	5.1%	136	4.1%	219	4.4%
Hispanic	625	38.5%	982	29.4%	1,607	32.3%
Other	69	4.3%	130	3.9%	199	4.0%
Birthplace						
U.S. States / D.C.	1,200	73.8%	2,505	74.8%	3,705	74.5%
Puerto Rico / US Terr.	191	11.7%	285	8.5%	476	9.6%
Non-U.S.-born	235	14.5%	560	16.7%	795	16.0%
Prenatal care funding[2]						
Public	1,205	75.5%	2,482	75.2%	3,687	74.3%
Private, other	390	24.5%	819	24.8%	1,209	24.7%
	Pregnancy related factors					
Adequacy of Prenatal Care[3]						
Adequate Total[4]	1,097	68.2%	2,380	71.7%	3,477	70.6%
Adequate Intensive	545	33.9%	1,105	33.3%	1,650	33.5%
Adequate Basic	552	34.3%	1,275	38.4%	1,827	37.1%
Intermediate	137	8.5%	310	9.3%	447	9.1%
Inadequate/None	375	23.3%	628	18.9%	1,003	20.4%
Unknown	18	1.1%	34	1.0%	52	1.0%
Parity[6]						
1	1,503	92.7%	2,679	80.1%	4,182	84.2%
2	106	6.5%	560	16.7%	666	13.4%
3+	13	0.8%	107	3.2%	120	2.4%
Smoking during Pregnancy						
Yes	234	14.4%	670	20.0%	904	18.2%
No	1,389	85.6%	2,674	80.0%	4,063	81.8%
	Birth outcomes					
Birthweight						
< 500 gms	3	--[5]	7	0.2%	10	0.2%
500-1,499 gms	28	1.7%	57	1.7%	85	1.7%
1,500-2,499 gms	119	7.3%	272	8.1%	391	7.9%
LBW (0-2,499 gms)	150	9.2%	336	10.0%	486	9.8%
2,500-3,999 gms	1,392	85.8%	2,811	84.0%	4,203	84.6%
4000+ gms	80	4.9%	198	5.9%	278	5.6%
Gestational age						
< 28 weeks	14	0.9%	38	1.1%	52	1.1%
< 37 weeks	128	7.9%	261	7.9%	389	7.9%
37-42 weeks	1,469	91.2%	3,018	90.9%	4,487	91.1%
43+ weeks	0	0.0%	2	--[5]	2	--[5]
Plurality						
Singleton	1,613	99.1%	3,299	98.4%	4,912	98.7%
Multiple birth	14	0.9%	53	1.6%	67	1.3%

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. For state total row, percentages are based on total births to women ages 15-19. For the rest of the table, percentages are based on all births for a given age group and characteristic. 2. See Glossary for definitions of categories. 3. Based on Adequacy of Prenatal Care Utilization (APNCU) Index. 4. Adequate Total = Adequate Basic + Adeq. Intensive. 5. Calculations based on fewer than five events are excluded. 6. Number of live births including the current birth.

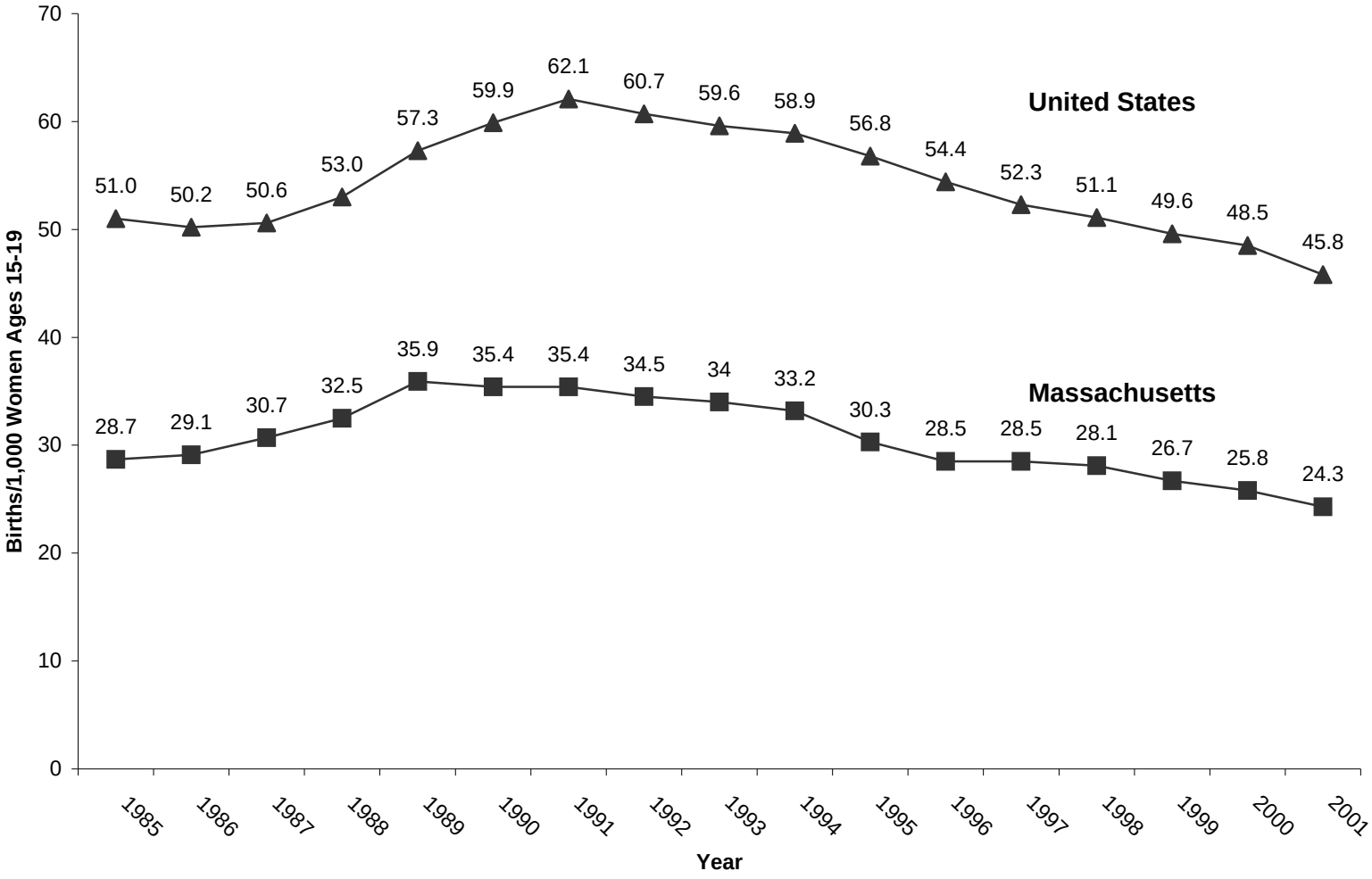
Figure 5. Comparison of Teen vs. Adult Births, Selected Characteristics, Massachusetts: 2001



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

Definitions: Unmarried = marital status at time of birth. Adequate Prenatal Care = based on Adequacy of Prenatal Care Utilization (APNCU) Index. See Appendix (Glossary and Technical Notes) for more details on the APNCU Index. Preterm Birth = gestational age less than 37 weeks, based on clinical estimate of gestational age. Low Birthweight = less than 2,500 grams (5.5 lbs.).

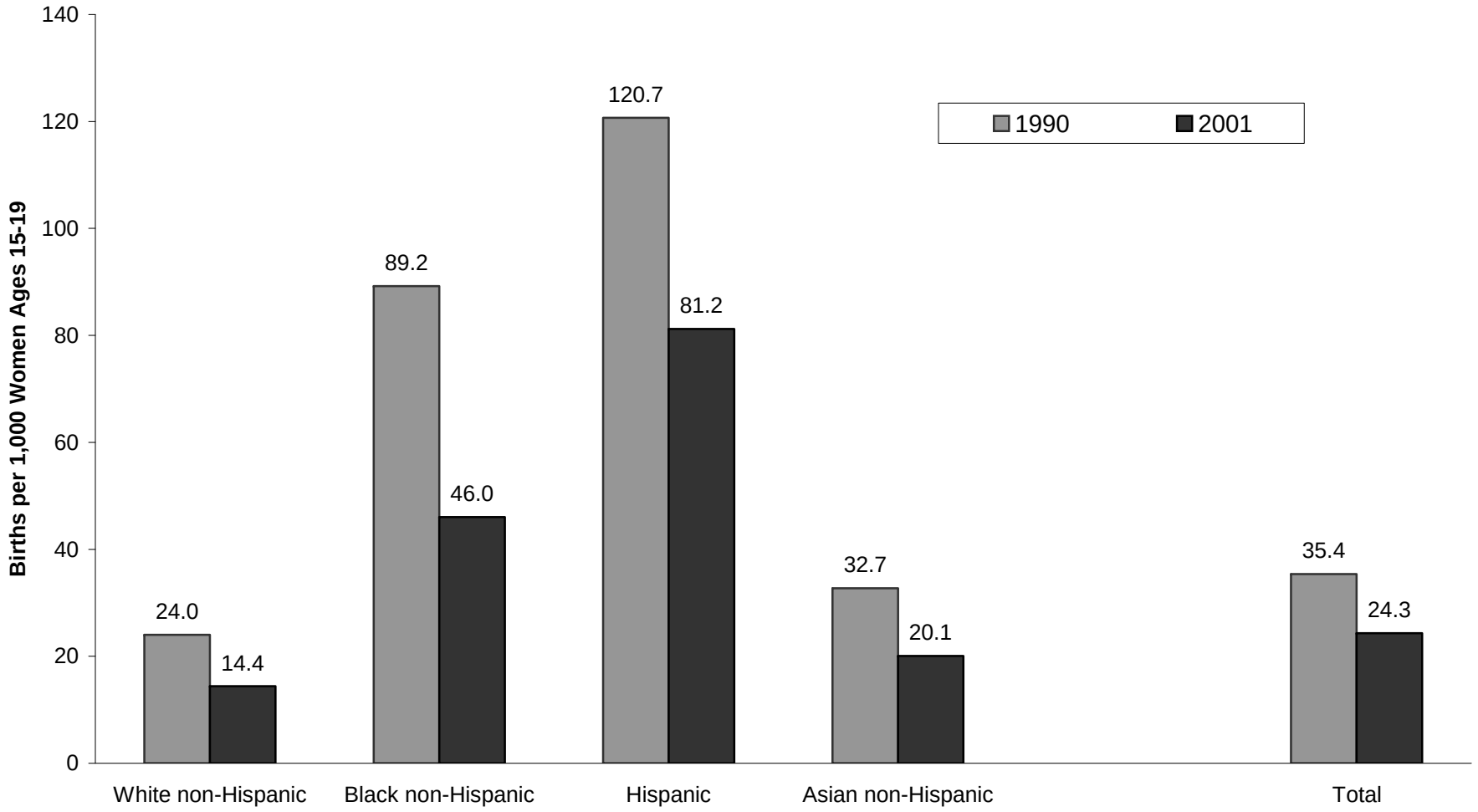
Figure 6. Trend in Birth Rates Among Women Ages 15-19, Massachusetts and the United States: 1985-2001



Teen birth rate is number of births to women ages 15-19 per 1,000 women ages 15-19

Data sources: 1) U.S. annual natality data (NCHS) and 1990 U.S. Census data (population data used in denominators); 2) Massachusetts: annual birth data files, decennial Census counts (1990, 2000) and intercensal population estimates based on MISER (Massachusetts Institute for Social and Economic Research) population estimates for 1991 through 1998 and DPH population estimates for 1999. 2000 and 2001 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts.

Figure 7. Birth Rates Among Women Ages 15-19 by Mother's Race/Hispanic Ethnicity, Massachusetts: 1990 and 2001



Teen birth rate is number of births to women ages 15-19 per 1,000 women ages 15-19
Population data sources: denominators for 1990 rates are based on the 1990 U.S. Census. 2001 birth rates are calculated using DPH 2000 population estimates, based on U.S. Census 2000 population counts.

Table 10. Resident Teen Birth Characteristics, 30 Largest Municipalities[1], Massachusetts: 2001

Municipality	Total Population Rank	Female Population, age 15-19	Number of Teen Births	Teen Birth Rate[2]	Mother's Race and Hispanic Ethnicity (% of births)			
					White non-Hispanic	Black non-Hispanic	Hispanic	Asian or other[3]
State Total		**205,277**	**4,979**	**24.3**	**46.6**	**12.5**	**32.3**	**8.4**
Arlington	29	767	5	6.5	60.0	20.0	20.0	0.0
Attleboro	30	1,151	39	33.9	66.7	5.1	10.3	15.4
Barnstable	25	1,287	36	28.0	75.0	8.3	11.1	5.6
Boston	1	22,240	702	31.6	13.1	42.7	33.9	10.3
Brockton	6	3,304	170	51.5	41.8	25.9	10.6	21.8
Brookline	17	1,382	4	--[5]	--[5]	--[5]	--[5]	--[5]
Cambridge	5	3,733	16	4.3	37.5	18.8	37.5	6.3
Chicopee	21	1,809	73	40.4	53.4	9.6	37.0	0.0
Fall River	8	2,915	155	53.2	71.0	9.0	11.0	8.4
Framingham	14	1,925	46	23.9	43.5	4.4	47.8	4.4
Haverhill	16	1,793	62	34.6	64.5	6.5	27.4	0.0
Lawrence	13	2,847	271	95.2	13.3	1.9	80.8	3.7
Lowell	4	3,913	215	55.0	30.7	2.8	27.9	37.7
Lynn	9	2,990	158	52.8	27.2	7.0	43.0	22.8
Malden	18	1,391	28	20.1	42.9	21.4	25.0	10.7
Medford	20	1,749	7	4.0	42.9	0.0	28.6	28.6
Methuen	28	1,264	49	38.8	59.2	4.1	36.7	0.0
New Bedford	7	2,978	185	62.1	53.0	8.7	28.1	10.3
Newton	11	3,411	7	2.1	28.6	28.6	42.9	0.0
Peabody	24	1,300	22	16.9	86.4	0.0	4.6	9.1
Pittsfield	27	1,361	49	36.0	73.5	10.2	12.2	4.1
Plymouth	23	1,577	20	12.7	80.0	10.0	5.0	5.0
Quincy	10	1,950	30	15.4	80.0	10.0	3.3	6.7
Revere	26	1,215	50	41.2	38.0	10.0	38.0	14.0
Somerville	12	2,087	42	20.1	54.8	16.7	26.2	2.4
Springfield	3	6,037	431	71.4	14.9	21.1	61.3	2.6
Taunton	19	1,652	63	38.1	66.7	4.8	15.9	12.7
Waltham	15	2,251	23	10.2	47.8	8.7	34.8	8.7
Weymouth	22	1,331	22	16.5	86.4	0.0	13.6	0.0
Worcester	2	6,918	269	38.9	47.2	7.4	40.2	5.2

Table 10 (cont.). Resident Teen Birth Characteristics, 30 Largest Municipalities, Massachusetts: 2001

Municipality	Public payment for prenatal care[4] (%)	Unmarried (%)	Low Birthweight[6] (%)	Preterm[7] (%)	Adequacy of Prenatal Care[8]			
					Adequate Intensive	Adequate Basic	Intermediate	Inadequate
State Total	**75.3**	**90.5**	**9.8**	**8.9**	**33.5**	**37.1**	**9.1**	**20.4**
Arlington	60.0	60.0	0.0	0.0	20.0	20.0	0.0	60.0
Attleboro	62.5	94.9	7.7	12.8	33.3	20.5	12.8	33.3
Barnstable	88.6	94.4	2.8	0.0	22.2	50.0	11.1	16.7
Boston	79.3	92.3	12.7	10.0	31.4	41.6	7.6	19.4
Brockton	75.3	95.9	9.4	8.2	33.5	35.3	11.2	20.0
Brookline	--[5]	75.0	0.0	0.0	--[5]	--[5]	0.0	0.0
Cambridge	50.0	93.8	12.5	18.8	25.0	56.3	6.3	12.5
Chicopee	79.2	90.4	8.2	11.0	36.6	36.6	5.6	21.1
Fall River	77.9	92.3	9.7	9.1	63.9	11.0	0.7	24.5
Framingham	69.6	80.4	8.7	8.7	34.1	43.2	0.0	22.7
Haverhill	70.0	83.9	4.8	3.2	33.9	40.3	9.7	16.1
Lawrence	86.2	91.5	10.7	8.5	27.0	40.4	8.9	23.7
Lowell	77.6	93.0	11.2	9.4	21.2	29.3	14.6	34.9
Lynn	86.5	93.0	7.0	8.9	38.2	29.3	11.5	21.0
Malden	78.6	78.6	21.4	10.7	39.3	28.6	7.1	25.0
Medford	57.1	57.1	0.0	0.0	57.1	28.6	0.0	14.3
Methuen	65.3	85.7	12.2	8.2	32.7	38.8	8.2	20.4
New Bedford	82.8	90.8	13.0	13.0	34.1	36.8	8.2	20.9
Newton	71.4	71.4	0.0	0.0	0.0	57.1	14.3	28.6
Peabody	63.6	81.8	18.2	9.1	36.4	27.3	18.2	18.2
Pittsfield	79.6	91.8	12.2	10.2	22.5	32.7	32.7	12.2
Plymouth	63.2	100.0	10.0	15.0	47.4	36.8	0.0	15.8
Quincy	83.3	90.0	6.7	10.0	33.3	43.3	10.0	13.3
Revere	80.0	90.0	6.0	4.0	46.0	24.0	4.0	26.0
Somerville	71.4	85.7	4.8	2.4	47.6	33.3	4.8	14.3
Springfield	83.3	96.1	10.9	11.4	28.6	35.1	10.5	25.8
Taunton	73.8	87.3	4.8	6.4	27.9	37.7	11.5	23.0
Waltham	65.2	91.3	21.7	21.7	26.1	60.9	0.0	13.0
Weymouth	59.1	81.8	9.1	13.6	50.0	36.4	4.6	9.1
Worcester	78.4	88.1	7.8	6.0	25.2	60.2	7.1	7.5

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. The 30 largest municipalities are the cities and towns in Massachusetts with the largest populations according to DPH 2000 population estimates, based on the U.S. Census 2000 population counts (see Technical Notes in Appendix). 2 Birth rates represent the number of births per 1,000 females age 15-19. 3 Mothers who designated themselves as Asian, American Indian, or Other. 4. See Glossary under "Prenatal Care Payment Source." 5. Calculations based on fewer than five events are excluded. 6. Less than 2,500 grams or 5.5 pounds. 7. Less than 37 weeks gestational age. 8. Based on Adequacy of Prenatal Care Utilization (APNCU) Index. Please see Glossary and Technical Notes in the Appendix for definitions of index and adequacy categories.

Table 11. Trends in Teen Birth Rates for Selected Communities[1], Ranked by 2001 Teen Birth Rate[2], Massachusetts: 2001, 2000, 1991

2001 Rank	Municipality	2001		2000		1991[3]	
		Number of Teen Births	Teen Birth Rate	Number of Teen Births	Teen Birth Rate	Number of Teen Births	Teen Birth Rate
	State Total	**4,979**	**24.3**	**5,305**	**25.8**	**6,892**	**35.4**
1	Lawrence	271	95.2	278	97.6	349	135.0
2	Holyoke	133	87.9	133	87.9	185	134.6
3	Chelsea	89	80.8	89	80.8	78	88.9
4	Southbridge	43	77.3	38	68.3	46	84.6
5	Springfield	431	71.4	466	77.2	561	99.6
6	New Bedford	185	62.1	195	65.5	275	84.8
7	Fitchburg	91	59.9	92	60.6	98	59.6
8	Lowell	215	55.0	248	63.4	276	76.5
9	Fall River	155	53.2	150	51.5	203	70.4
10	Lynn	158	52.8	189	63.2	178	76.8
11	Brockton	170	51.5	218	66.0	208	70.9
12	Revere	50	41.2	35	28.8	36	35.9
13	Chicopee	73	40.4	56	31.0	69	40.0
14	Salem	48	39.4	34	27.9	42	34.7
15	Worcester	269	38.9	290	41.9	388	60.9
16	Methuen	49	38.8	35	27.7	53	43.3
17	Taunton	63	38.1	62	37.5	96	63.9
18	Pittsfield	49	36.0	58	42.6	69	48.7
19	Haverhill	62	34.6	68	37.9	109	73.3
20	Attleboro	39	33.9	47	40.8	42	39.0
21	Boston	702	31.6	785	35.3	1082	53.7
22	Leominster	37	30.3	63	51.6	47	43.4
23	Framingham	46	23.9	45	23.4	50	24.2
24	Westfield	39	21.7	30	16.7	47	29.2
25	Somerville	42	20.1	47	22.5	64	31.4

1. Selected communities include the 25 Massachusetts cities and towns with the greatest number of teen births. Ranking is by 2001 teen birth rate. 2. Rates are per 1,000 females ages 15-19 per city/town. 3. Source for 1991 births and rates: Massachusetts Community Health Information Profile (MassCHIP), MDPH, v2.8 r270, January 2003; natality dataset and MISER 1991 population estimate.

CHAPTER 3

INFANT AND MATERNAL MORTALITY

Overall Changes in Infant Mortality Rate

In 2001, there were 407 infant deaths (deaths of children less than one year of age) among Massachusetts residents, 30 more infant deaths than in 2000 (Table 12A).

The infant mortality rate (IMR) in 2001 was 5.0 deaths per 1,000 live births. Although the 2001 Massachusetts IMR is 9% greater than the 2000 rate of 4.6 (the lowest number of annual infant deaths in Massachusetts history), it is the second lowest rate since 1980 and is a 29% decrease since 1990 (Table 12A).

The 2001 Massachusetts IMR is 24% below the 2001 U.S. preliminary rate of 6.6 (National Vital Statistics Report, Vol. 50, No. 11, June 26, 2002, p. 1).

Race and Ethnicity Patterns in Infant Mortality Rates

The 2001 IMR for whites was 4.5 deaths per 1,000 live births in 2001, a 13% increase from the 2000 rate (Table 12A). The IMR for black infants was 11.7 deaths per 1,000 live births, which is the same as the rate in 2000.

Since 1980, there has been a substantial decline in IMRs among black and white infants. From 1980 to 2001, the IMR decreased by 54% for whites and 37% for blacks. However, the IMR for black infants was consistently more than twice as high as the IMR for white infants during this time period. This year the disparity in IMR between white and black infants has decreased, after increasing for two years (Figure 8).

The Massachusetts death certificate was revised in 1989 to include an Hispanic identifier. This revision enables the calculation of non-Hispanic white, non-Hispanic black, and Hispanic infant mortality rates (Table 12B). Infants born to non-Hispanic black mothers continue to have the highest IMR (12.1 per 1,000 live births), although this rate represents a 5% decrease from the 2000 rate (12.8).

The IMR for Hispanics rose 40% from 5.2 deaths per 1,000 live births in 2000 to 7.3 deaths per 1,000 live births in 2001 (Table 12B). The 2001 IMR for Hispanic infants is 44% higher than the non-Hispanic white rate (4.1) and 40% below the non-Hispanic black rate (12.1).

The IMR for white non-Hispanics increased 8% from 2000 (3.8) to 2001 (4.1) (Table 12B).

Asian infants had the lowest mortality rate of all groups in 2001 with an IMR of 3.1 deaths per 1,000 live births (Table 12B). However, caution should be used when interpreting this rate since it is based on a small number of deaths.

Neonatal and Post Neonatal Mortality Rates

The overall neonatal mortality rate (deaths among infants less than 28 days old) was 3.8 per 1,000 live births in 2001, which is an increase of 9% over the 2000 neonatal mortality rate of 3.5, the lowest neonatal mortality rate in Massachusetts history (Table 12B).

As was true for infant mortality, the direction of change differed by race/ethnicity groups. Decreases occurred for non-Hispanic blacks and Asians, while the rate for non-Hispanic whites and Hispanics increased (Table 12B).

The overall post neonatal mortality rate (deaths among infants between 28 and 364 days old), was 1.2 in 2001, which was a slight increase over the 2000 rate (1.1) (Table 12B). The post neonatal mortality rate for non-Hispanic black infants decreased from 2.9 in 2000 to 2.6 in 2001, although it is still almost three times that of white non-Hispanics. The post neonatal mortality rate for Hispanic infants increased 75% in 2001, from 1.2 per 1,000 live births to 2.1 in 2001.

Trends in the Time of Infant Deaths

From 1990 to 2001, the percentage of all infant deaths that occurred in the post neonatal period (28-364 days) declined from 31% to 26% (Figure 10). During the same time period, the percentage of infant deaths that occurred in the early neonatal period (within the first 24 hours after birth) rose from 44% to 57% of all infant deaths, and the percentage of infant deaths occurring later in the neonatal period (from 1-27 days) remained about the same (25%).

(Cause-specific infant death information will be available in the upcoming report, *Massachusetts Deaths 2001*.)

Pregnancy-Associated and Maternal Mortality Ratios

In 2001, there were 21 pregnancy-associated deaths, including 4 maternal deaths (Fig. 11). A pregnancy-associated death is the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. Women who die from a cause related to pregnancy or childbirth either during pregnancy or up to 42 days after pregnancy termination are called maternal deaths and are a subset of pregnancy-associated deaths. (See technical notes for further information).

The 2001 pregnancy-associated mortality ratio (PAMR) was 25.5 deaths per 100,000 live births and the maternal mortality ratio (MMR) was 4.9 per 100,000 live births (Figure 11). Since 1990, the annual PAMR fluctuated from a low of 18.0 in 1990 to a high of 31.8 in 1994. However, due to the small number of cases, the differences are not statistically significant.

Table 12A. Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race[1], Massachusetts: 1980-2001

INFANT MORTALITY

	State Total[2]		White		Black		Asian/Other[3]	
Year	n	Rate[4]	n	Rate[4]	n	Rate[4]	n	Rate
1980	748	10.3	655	9.8	87	18.6	5	4.6
1981	710	9.6	616	9.1	85	18.2	8	6.1
1982	764	10.1	656	9.4	102	21.3	5	3.3
1983	682	9.0	579	8.3	89	19.0	12	7.4
1984	699	8.9	601	8.4	82	16.4	13	7.5
1985	745	9.1	608	8.1	126	23.8	11	6.1
1986	695	8.4	560	7.5	123	22.0	11	4.6
1987	608	7.2	486	6.4	110	17.5	12	4.5
1988	693	7.9	546	7.0	133	19.5	13	3.8
1989	697	7.6	549	6.8	131	17.7	17	4.8
1990	649	7.0	519	6.4	106	13.7	24	6.5
1991	577	6.5	461	6.0	102	13.8	14	3.9
1992	569	6.5	438	5.7	114	15.8	17	4.7
1993	523	6.2	423	5.7	87	12.5	13	3.5
1994	499	6.0	407	5.6	81	12.0	11	2.9
1995	419	5.1	333	4.7	65	10.3	21	5.5
1996	403	5.0	329	4.7	65	10.8	8	2.0
1997	425	5.3	349	5.0	66	10.6	10	2.4
1998	414	5.1	345	4.9	59	9.3	10	2.3
1999	418	5.2	334	4.8	75	11.4	9	1.9
2000	377	4.6	280	4.0	76	11.7	19	3.6
2001	407	5.0	314	4.5	77	11.7	16	3.0

Table 12A (cont'd). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race[1], Massachusetts: 1980-2001

NEONATAL MORTALITY

	State Total[2]		White		Black		Asian/Other[3]	
Year	**n**	**Rate[4]**	**n**	**Rate[4]**	**n**	**Rate[4]**	**n**	**Rate[4]**
1980	550	7.6	483	7.2	62	13.3	5	4.6
1981	510	6.9	442	6.5	59	12.4	5	3.8
1982	573	7.6	494	7.1	75	15.7	3	--[5]
1983	482	6.3	411	5.9	63	13.4	7	4.3
1984	472	6.0	411	5.8	49	9.8	8	4.6
1985	538	6.6	447	6.0	85	16.0	5	2.8
1986	478	5.8	383	5.2	89	15.9	5	2.1
1987	432	5.1	343	4.6	80	12.7	9	3.4
1988	477	5.4	383	4.9	87	12.8	6	1.8
1989	479	5.2	376	4.7	95	12.8	8	2.3
1990	446	4.8	347	4.3	80	10.3	9	5.1
1991	401	4.5	319	4.1	72	9.8	10	2.8
1992	415	4.8	325	4.3	79	10.9	11	3.1
1993	375	4.4	300	4.1	66	9.5	9	2.4
1994	349	4.2	280	3.8	60	8.9	9	2.4
1995	298	3.6	237	3.3	50	7.9	11	2.9
1996	290	3.6	249	3.5	35	5.8	5	1.2
1997	323	4.0	271	3.9	45	7.2	7	1.7
1998	315	3.9	261	3.7	47	7.4	7	1.6
1999	332	4.1	265	3.8	61	9.3	6	1.3
2000	288	3.5	214	3.1	58	8.9	14	2.7
2001	308	3.8	239	3.5	59	9.0	10	1.9

Table 12A (cont'd). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race[1], Massachusetts: 1980-2001

POST NEONATAL MORTALITY

Year	State Total[2]		White		Black		Asian/Other[3]	
	n	Rate[4]	n	Rate[4]	n	Rate[4]	n	Rate[4]
1980	198	2.7	172	2.6	25	5.3	0	0.0
1981	200	2.7	174	2.6	26	5.8	3	--[5]
1982	191	2.5	162	2.3	27	5.6	2	--[5]
1983	200	2.7	168	2.4	26	5.6	5	3.1
1984	227	2.9	190	2.6	33	6.6	5	2.9
1985	207	2.5	161	2.1	41	7.8	6	3.3
1986	217	2.6	177	2.3	34	6.1	6	2.5
1987	176	2.1	143	1.8	30	4.8	3	--[5]
1988	216	2.5	163	2.1	46	6.7	7	2.0
1989	218	2.4	173	2.1	36	4.9	9	2.5
1990	203	2.2	172	2.1	26	3.4	5	1.4
1991	176	2.0	142	1.8	30	4.1	4	--[5]
1992	154	1.8	113	1.5	35	4.8	6	1.7
1993	148	1.7	123	1.7	21	3.0	4	--[5]
1994	150	1.8	127	1.7	21	3.1	2	--[5]
1995	121	1.5	96	1.3	15	2.4	10	2.6
1996	113	1.4	80	1.1	30	5.0	3	--[5]
1997	102	1.3	78	1.1	21	3.4	3	--[5]
1998	99	1.2	84	1.2	12	1.9	3	--[5]
1999	86	1.1	69	1.0	14	2.1	3	--[5]
2000	89	1.1	66	0.9	18	2.8	5	1.0
2001	99	1.2	75	1.1	18	2.7	6	1.1

1. Hispanic origin could not be identified from the Massachusetts death certificate before 1989; thus, Hispanic trend data are not available. Most Hispanics are included in the race category of white. Hispanic infant mortality data for the years 1990 through 1999 are presented in Table 9B. 2. Deaths of infants of unknown race are included in the total calculation. For rate computations, infants of unknown race are allocated into the race categories according to the distribution of births of known race. 3. Other: American Indian and Other races. 4. Rates are expressed per 1,000 live births. 5. Calculations based on fewer than five events are excluded.

Table 12B. Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race and Hispanic Ethnicity, Massachusetts: 1990-2001

INFANT MORTALITY

	State Total[1]		Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian		Other[2]	
Year	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]
1990	649	7.0	442	6.1	98	13.7	77	9.1	24	7.0	8	9.5
1991	577	6.5	381	5.5	101	15.0	80	9.4	14	4.2	1	--[4]
1992	569	6.5	371	5.5	110	16.4	67	7.9	16	4.9	5	5.1
1993	523	6.2	346	5.3	84	13.1	77	9.3	13	3.9	3	--[4]
1994	499	6.0	343	5.3	79	12.6	64	7.6	8	2.4	5	5.3
1995	419	5.1	275	4.4	65	11.1	58	7.2	19	5.5	2	--[4]
1996	403	5.0	289	4.7	63	11.4	40	5.1	8	2.2	2	--[4]
1997	425	5.3	294	4.8	64	11.7	55	6.7	10	2.6	2	--[4]
1998	414	5.1	287	4.6	59	10.6	58	6.7	10	2.7	0	0.0
1999	418	5.2	285	4.7	72	12.3	49	5.5	8	1.9	4	--[4]
2000	377	4.6	232	3.8	74	12.8	48	5.2	19	4.1	4	--[4]
2001	407	5.0	245	4.1	71	12.1	69	7.3	15	3.1	7	4.1

NEONATAL MORTALITY

	State Total[1]		Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian		Other[2]	
Year	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]	n	Rate[3]
1990	446	4.8	298	4.1	75	10.5	49	5.8	19	5.5	5	5.5
1991	401	4.5	266	3.9	72	10.7	53	6.2	10	3.0	0	0.0
1992	415	4.8	274	4.0	76	11.4	51	6.0	10	3.0	4	--[4]
1993	375	4.4	245	3.7	64	10.0	55	6.7	9	2.7	2	--[4]
1994	349	4.2	240	3.7	58	9.3	40	4.7	7	2.1	4	--[4]
1995	298	3.6	198	3.1	50	8.5	39	4.8	10	2.9	1	--[4]
1996	290	3.6	222	3.6	34	6.2	27	3.5	5	1.4	1	--[4]
1997	323	4.0	228	3.7	44	8.0	43	5.2	7	1.8	1	--[4]
1998	315	3.9	218	3.5	47	8.5	43	5.0	7	1.9	0	0.0
1999	332	4.1	226	3.7	58	9.9	39	4.4	5	1.2	4	--[4]
2000	288	3.5	177	2.9	57	9.9	37	4.0	14	3.0	3	--[4]
2001	308	3.8	190	3.2	56	9.5	49	5.2	10	2.1	3	--[4]

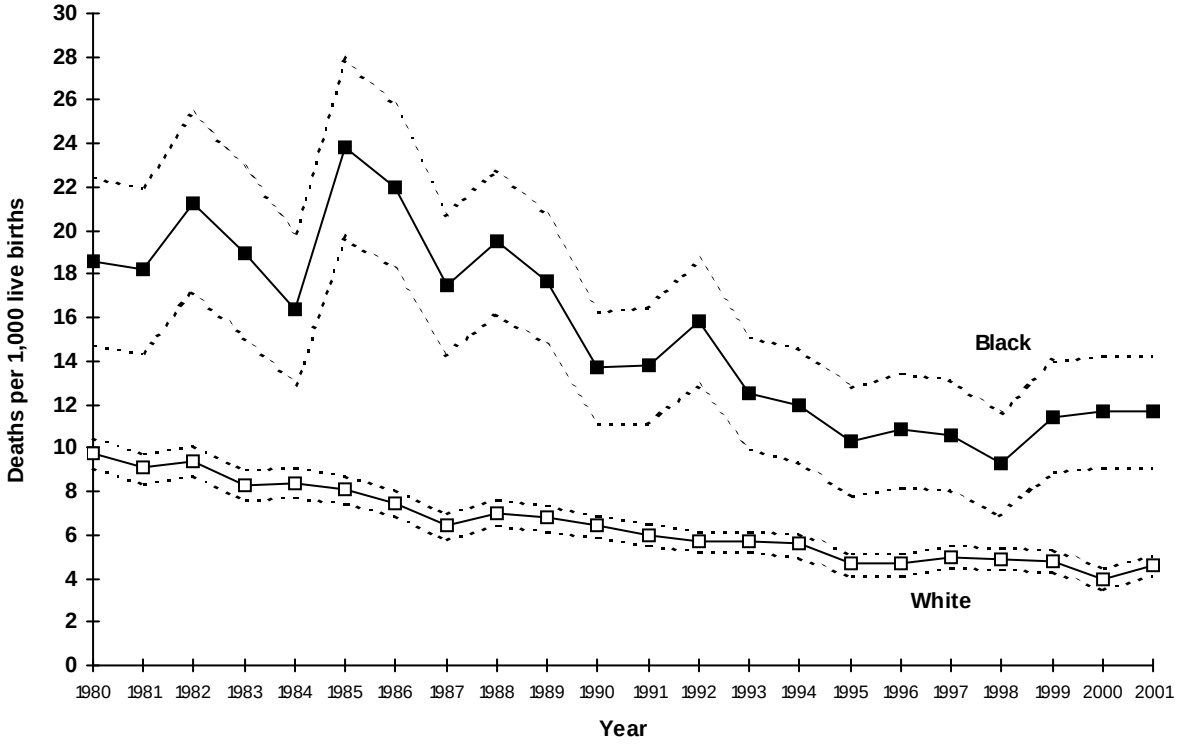
Table 12B (cont.). Trends in Infant, Neonatal, and Post Neonatal Mortality, by Race and Hispanic Ethnicity, Massachusetts: 1990-2001

POST NEONATAL MORTALITY

	State Total[1]		Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian		Other[2]	
Year	**n**	**Rate[3]**	**n**	**Rate[3]**	**n**	**Rate[3]**	**n**	**Rate[3]**	**n**	**Rate[3]**	**n**	**Rate[3]**
1990	203	2.2	144	2.0	23	3.2	28	3.3	5	1.5	3	--[4]
1991	176	2.0	115	1.7	29	4.3	27	3.2	4	--[4]	1	--[4]
1992	154	1.8	97	1.4	34	5.1	16	1.9	6	1.8	1	--[4]
1993	148	1.7	101	1.5	20	3.1	22	2.7	4	--[4]	1	--[4]
1994	150	1.8	103	1.6	21	3.3	24	2.8	1	--[4]	1	--[4]
1995	121	1.5	77	1.2	15	2.6	19	2.3	9	2.6	1	--[4]
1996	113	1.4	67	1.1	29	5.3	13	1.7	3	--[4]	1	--[4]
1997	102	1.3	66	1.1	20	3.7	12	1.5	3	--[4]	1	--[4]
1998	99	1.2	69	1.1	12	2.2	15	1.7	3	--[4]	0	0.0
1999	86	1.1	59	1.0	14	2.4	10	1.1	3	--[4]	0	0.0
2000	89	1.1	55	0.9	17	2.9	11	1.2	5	1.1	1	--[4]
2001	99	1.2	55	0.9	15	2.6	20	2.1	5	1.0	4	--[4]

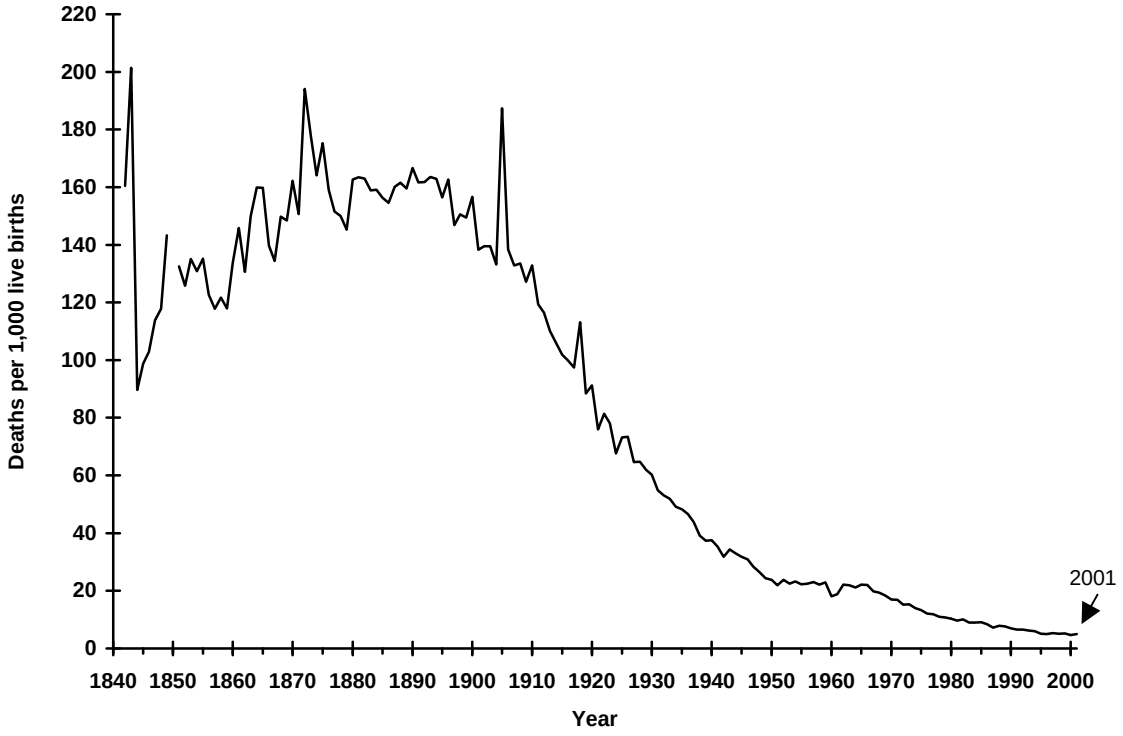
1. Deaths of infants of unknown race are included in the total calculation. For rate computations, births of infants of unknown race are allocated into the race categories according to the distribution of births of known race. 2. Other: American Indian and Other races. 3. Rates are expressed per 1,000 live births.
4. Calculations based on fewer than five events are excluded.

Figure 8. Infant Mortality Rates and 95% Confidence Intervals[1] by Race[2], Massachusetts: 1980-2001



1. See Appendix for explanation
2. For rate computations, infant births of unknown race are allocated into race categories according to the distribution of the births of known race.
3. On tables and graphs that include data prior to June 1986, the race classifications do not include ethnicity; most Hispanics are included in the race category of whites.

Figure 9. Infant Mortality Rates, Massachusetts: 1842-2001[1]



1. Data not available for 1850.

Figure 10. Trends in the Timing of Infant Deaths, 1990-2001

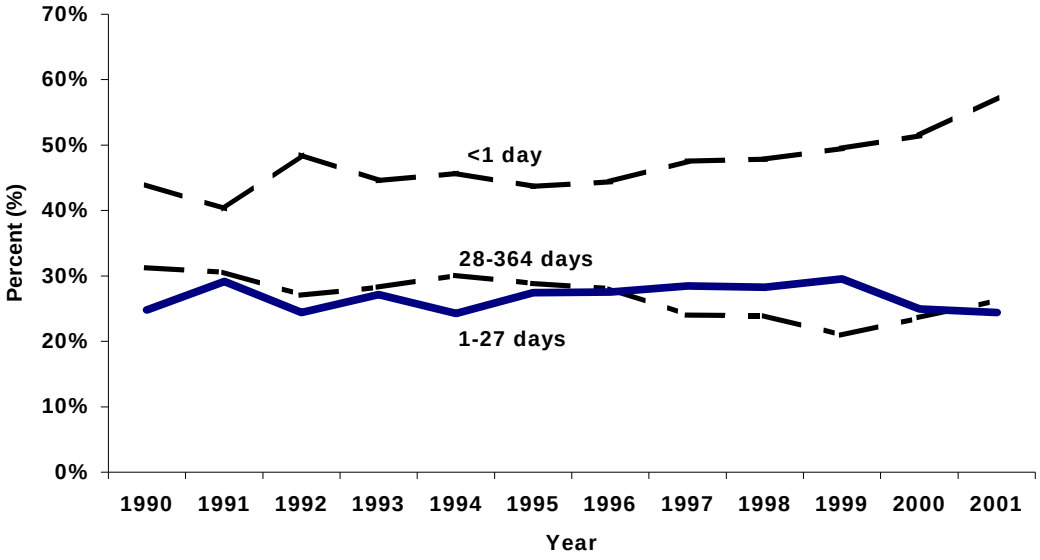
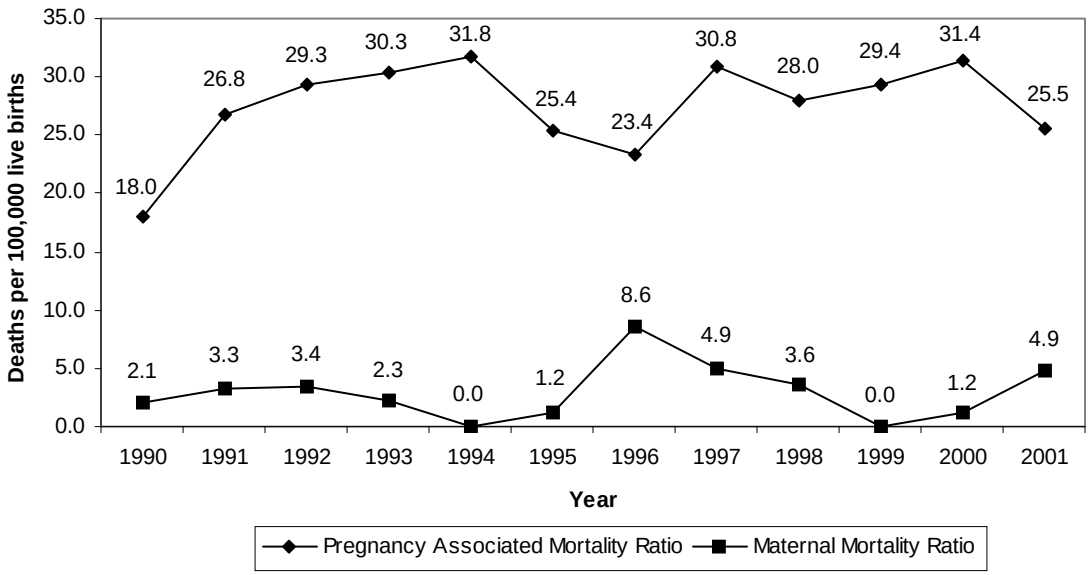


Figure 11. Trends in Pregnancy-Associated[1] and Maternal Mortality[2], Massachusetts: 1990-2001



Number of Pregnancy-Associated[1] and Maternal Deaths[2], 1990-2001

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Pregnancy-Associated Deaths[1]	17	24	26	26	27	21	19	25	23	24	26	21
Maternal Deaths[2]	2	3	3	2	0	1	7	4	3	0	1	4

NOTE: Ratios shown in graph are per 100,000 live births. Ratios are based on occurrence births, not resident births.

1. Pregnancy-associated death is defined as the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. The pregnancy-associated mortality ratio is the number of pregnancy-associated deaths per 100,000 live occurrence births (see Definition of Rates and Technical Notes in Appendix for further information). 2. Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes. Maternal mortality ratio is the number of maternal deaths per 100,000 live occurrence births (see Definition of Rates and Technical Notes in Appendix for more information.)

CHAPTER 4

BIRTHWEIGHT AND GESTATIONAL AGE

Overall Birthweight Distribution

In 2001, 7.2% (5,795) of Massachusetts resident infants were low birthweight (less than 2,500 grams or 5.5 pounds), and 11.2% were 4,000 grams (8.8 pounds) or more (Table 13).

The low birthweight rate in 2001 was 7.2%, compared with 7.1% in 2000 (Table 15). In 2001, 1.4% (1,114) of infants born to Massachusetts resident women were very low birthweight (less than 1,500 grams or 3.3 pounds); this percentage has remained the same between 1999 and 2001.

The low birthweight rate in Massachusetts was 7% below the U.S. rate of 7.7% (National Vital Statistics Reports, Vol. 51, No. 2, December 2002, p.18).

Patterns of Birthweight by Race and Ethnicity

The proportion of low birthweight infants varied by mother's race and ethnicity (Table 13). Non-Hispanic black women had the highest proportion of low birthweight infants: 11.2%; Hispanic mothers delivered 8.2% low birthweight infants; Asian mothers, 7.3% low birthweight infants; and non-Hispanic white mothers delivered 6.6% low birthweight infants.

The proportion of low birthweight deliveries in 2001 remained the same as in 2000 for Hispanic and Asian mothers, while the rate for non-Hispanic blacks decreased from 12.0% to 11.2%, and the rate for non-Hispanic whites increased from 6.4% to 6.6% (data not shown).

The proportion of very low birthweight infants also varied by mother's race and ethnicity. Non-Hispanic black women had the highest proportion of very low birthweight infants: 3.2%; compared with 1.7% of Hispanics, 1.1% of Asians, and 1.2% of white non-Hispanics (Table 13).

Non-Hispanic white mothers delivered the highest proportion of high birthweight infants: 12.8% weighed 4,000 grams (8.8 pounds) or more (Table 13). This is a decrease from 2000, when the rate for non-Hispanic white mothers was 13.1% (data not shown).

The Massachusetts 2001 low birthweight rate for non-Hispanic black women, 11.2%, was lower than the U.S. rate for all black women, 13.1%. The rate of low birthweight for Massachusetts Hispanic women (8.2%) was higher than the corresponding 2001 U.S. rate of 6.5% (National Vital Statistics Report, Vol. 51, No. 2, December 2002, p. 79). This may be due to differences in the composition of the Hispanic population between Massachusetts and the nation as a whole. In Massachusetts, the Hispanic population is comprised mainly of Puerto Ricans, Dominicans, and Central Americans. The U.S. Hispanic population has a much greater percentage of Mexicans and Cubans who tend to have relatively low rates of low birthweight. The Massachusetts low birthweight rate for Puerto Ricans was 10.1% in 2001 (Table 2B), compared with 9.3% among Puerto Ricans nationwide in 2001(National Vital Statistics Report, Vol. 51, No. 2, December 18, 2002, page 57).

Birthweight and Age of Mother

In general, the relation between mother's age and percentage low birthweight follows a "U-shaped" distribution: the percentage of low birthweight deliveries is highest among both the youngest mothers (under age 24 years) and the oldest mothers (over age 35 years), while it is lowest for mothers between 25 and 34 years of age (Table 14).

Birthweight and Smoking

Cigarette smoking during pregnancy increases the likelihood of delivering a low birthweight infant. During 2001 in Massachusetts, 10.4% of infants born to mothers who smoked during pregnancy were low birthweight, compared with 6.8% of infants born to non-smoking mothers (Figure 12). Approximately 1 out of 6 (17.5%) infants born to black women who smoked during their pregnancy were low birthweight.

Low Birthweight and Plurality

The increase in low birthweight in Massachusetts over the past decade can in part be attributed to the dramatic increase in multiple births in Massachusetts. The percentage of low birthweight (LBW) and very low birthweight (VLBW) rises dramatically for twins and higher order births. In 2001, 5.1% of singleton births were LBW, whereas 49.2% of twins, and 93.3% of higher order births were LBW (Table 15). Similarly, 0.9% of singletons, 9.2% of twins, and 32.9% of higher order births were VLBW. The percentage of VLBW singleton infants remained approximately the same from 1990 to 2001, while LBW increased slightly in this group: 4.7% in 1990 to 5.1% in 2001. The percentage of VLBW and LBW deliveries for twins decreased slightly from 1999 to 2000, but remained steady in 2001.

Preterm Deliveries

In 2001, 8% (6,412) of infants born to Massachusetts resident women were preterm (premature), born before the mother had completed the 37th week of pregnancy (Table 16).

The percentage of preterm infants increased slightly from 1999 (7.6%) to 2000 (8.3%) and decreased slightly from 2000 to 2001 (8.0%) (data not shown).

The proportion of preterm births varied by mother's race and ethnicity. Non-Hispanic black women had the highest proportion of preterm infants, 12.1%. Hispanic women had 8.3% preterm deliveries; non-Hispanic white women, 7.6%; and Asian women had the lowest, 6.3% (Table 16).

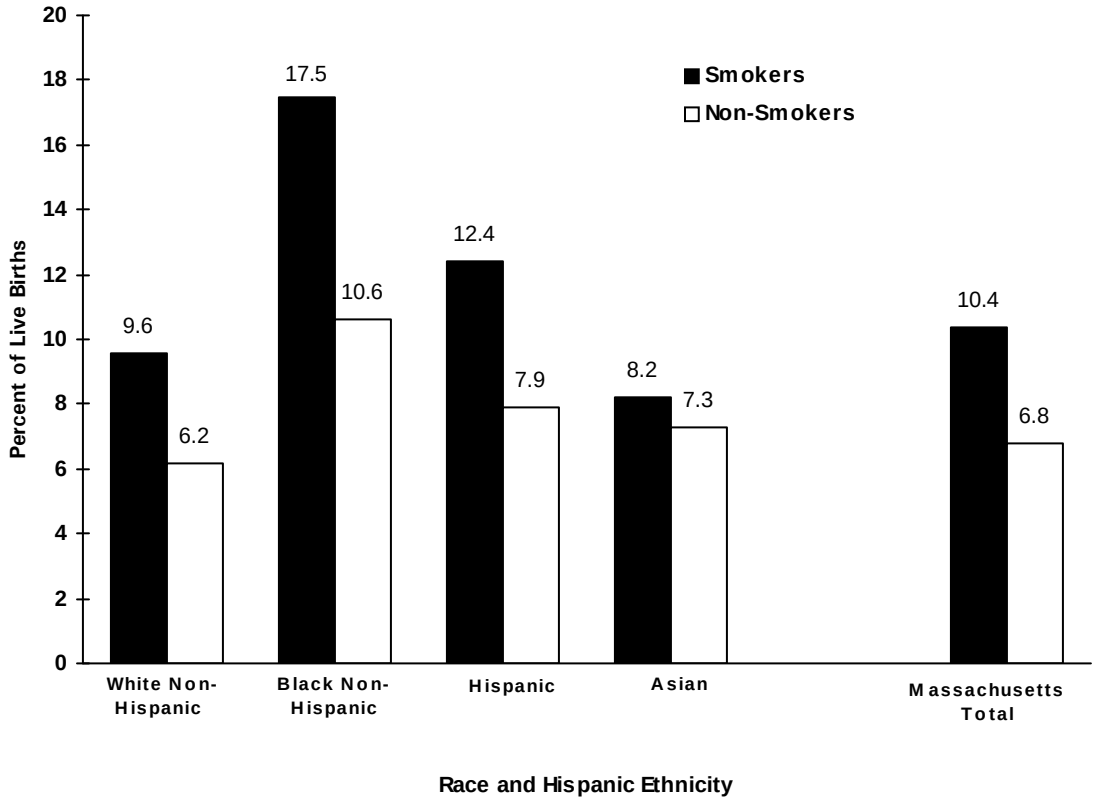
Table 13. Births by Birthweight, Race and Hispanic Ethnicity, Massachusetts: 2001

Birthweight (in grams)	Total		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other		Unknown
	n	%[1]	n	%[1]	n	%[1]	n	%[1]	n	%[1]	n	%[1]	n
State Total	81,014	100.0	59,115	100.0	5,862	100.0	9,410	100.0	4,784	100.0	1,698	100.0	145
<500	107	0.1	70	0.1	23	0.4	12	0.1	1	--[2]	1	--[2]	0
500-999	440	0.5	265	0.4	82	1.4	59	0.6	24	0.5	8	0.5	2
1000-1499	567	0.7	355	0.6	83	1.4	90	1.0	27	0.6	9	0.5	3
1500-1999	1,185	1.5	805	1.4	122	2.1	148	1.6	78	1.6	30	1.8	2
2000-2499	3,496	4.3	2,388	4.0	344	5.9	466	5.0	218	4.6	79	4.7	1
2500-2999	11,951	14.8	7,755	13.1	1,138	19.4	1,681	17.9	1,058	22.1	311	18.3	8
3000-3499	29,088	35.9	20,428	34.6	2,234	38.1	3,726	39.6	2,026	42.3	653	38.5	21
3500-3999	24,769	30.6	19,317	32.7	1,379	23.5	2,481	26.4	1,091	22.8	477	28.1	24
4000-4499	7,708	9.5	6,374	10.8	374	6.4	636	6.8	216	4.5	101	5.9	7
4500-4999	1,316	1.6	1,106	1.9	62	1.1	91	1.0	32	0.7	24	1.4	1
>=5000	103	0.1	81	0.1	8	0.1	8	0.1	4	--[2]	2	--[2]	0
Unknown	284	0.4	171	0.3	13	0.2	12	0.1	9	0.2	3	--[2]	76
VLBW[3] (0-1,499 g)	1,114	1.4	690	1.2	188	3.2	161	1.7	52	1.1	18	1.1	5
LBW[4] (0-2,499 g)	5,795	7.2	3,883	6.6	654	11.2	775	8.2	348	7.3	127	7.5	8

NOTE: Percentages for detailed birthweight rows ("<500" through "Unknown") are calculated based on all births including those with unknown birthweight. Percentages for VLBW and LBW rows are calculated based on births with known birthweights only.

1. Percentages are based on column totals. 2. Calculations based on fewer than five events are excluded. 3. Very Low Birthweight (VLBW): less than 1,500 grams (3.3 lbs.).
4. Low Birthweight (LBW): less than 2,500 grams (5.5 lbs.).

Figure 12. Low Birthweight[1] Among Smoking and Nonsmoking[2] Mothers, by Race and Hispanic Ethnicity, Massachusetts: 2001



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Maternal smoking is self-reported, usually following childbirth; these data should be interpreted cautiously.

1. Low birthweight: less than 2,500 grams or 5.5 pounds.
2. Based on information provided on the birth certificate by the mother.

Table 14. Low Birthweight (LBW)[1] by Maternal Age, Race and Hispanic Ethnicity, Massachusetts: 2001

Mother's Age (in years)	Total LBW Infants		White non-Hispanic		Black non-Hispanic		Hispanic		Asian		Other[4]		Unknown
	n	%[3]	n	%[3]	n	%[3]	n	%[3]	n	%[3]	n	%[3]	n
State Total[2]	5,795	7.2	3,883	6.6	654	11.2	775	8.2	348	7.3	127	7.5	8
<18	158	9.3	46	7.3	26	10.8	65	9.7	12	14.1	7	9.9	2
18-19	336	10.0	155	9.1	56	14.1	97	9.9	19	14.0	9	6.9	0
20-24	973	8.1	501	7.5	135	10.0	248	8.3	51	8.9	38	9.6	0
25-29	1,205	6.4	769	5.8	156	10.6	165	7.2	88	6.0	27	5.9	0
30-34	1,751	6.5	1,344	6.1	160	11.6	111	7.1	107	6.6	27	6.8	2
35-39	1,069	7.3	820	6.7	94	12.0	82	10.8	59	7.9	12	6.0	2
40+	303	9.5	248	9.4	27	12.1	7	4.6	12	8.8	7	16.7	2

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Low Birthweight (LBW): less than 2,500 grams or 5.5 pounds at birth. 2. State totals include women of unknown age. 3. Percentages are based upon the number of low birthweight infants divided by the total births in each age and race/ethnicity category. 4. Other races include American Indian and others not specified.

Table 15. Low Birthweight by Plurality, Massachusetts: 1990-2001

Age Group	Year	Singleton				Multiples												Total Births			
						Twin				Triplets or more				Total Multiples							
		VLBW[1]		LBW[2]		VLBW[1]		LBW[2]		VLBW[1]		LBW[2]		VLBW[1]		LBW[2]		VLBW[1]		LBW[2]	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
All Ages	**1990**	752	0.8	4,224	4.7	189	8.2	1,075	46.8	28	28.3	88	88.9	217	9.1	1,163	48.5	969	1.1	5,387	5.8
	1991	752	0.9	4,045	4.7	223	9.8	1,079	47.3	26	29.2	75	84.3	249	10.5	1,154	48.7	1,001	1.1	5,199	5.9
	1992	656	0.8	3,959	4.7	192	8.3	1,062	45.7	39	29.8	116	88.5	231	9.4	1,178	48.0	887	1.0	5,137	5.9
	1993	673	0.8	3,919	4.8	216	9.2	1,105	47.1	73	36.0	178	87.7	289	11.3	1,283	50.4	962	1.1	5,202	6.2
	1994	687	0.8	4,015	5.0	223	9.5	1,122	47.9	66	30.8	198	92.5	289	11.3	1,320	51.6	976	1.2	5,335	6.4
	1995	674	0.9	3,867	4.9	227	9.4	1,128	46.6	63	31.8	179	90.4	290	11.1	1,307	49.9	964	1.2	5,174	6.4
	1996	657	0.9	3,674	4.8	227	8.8	1,264	49.1	45	24.5	167	90.8	272	9.9	1,431	51.9	929	1.2	5,105	6.4
	1997	731	0.9	3,938	5.1	292	10.3	1,439	50.5	75	28.6	240	91.6	367	11.8	1,679	54.0	1,098	1.4	5,617	7.0
	1998	690	0.9	3,819	4.9	298	9.6	1,570	50.7	82	28.5	266	92.4	380	11.2	1,836	54.2	1,070	1.3	5,655	7.0
	1999	731	0.9	3,869	5.0	324	10.3	1,617	51.6	65	26.5	222	90.6	389	11.5	1,839	54.5	1,120	1.4	5,708	7.1
	2000	722	0.9	3,886	5.1	284	8.9	1,603	50.0	84	35.0	222	92.5	368	10.7	1,825	53.0	1,090	1.4	5,711	7.1
	2001	730	0.9	3,931	5.1	310	9.2	1,654	49.2	74	32.9	210	93.3	384	10.7	1,864	52.0	1,114	1.4	5,795	7.2
Ages < 35	**1990**	646	0.8	3,666	4.6	164	8.5	915	47.3	21	30.0	62	88.6	185	9.2	977	48.8	831	1.0	4,643	5.7
	1991	647	0.9	3,499	4.7	189	10.2	898	48.3	25	32.9	65	85.5	214	11.1	963	49.8	861	1.1	4,462	5.8
	1992	551	0.8	3,378	4.6	166	8.8	870	46.0	29	28.7	92	91.1	195	9.8	962	48.3	746	1.0	4,340	5.8
	1993	561	0.8	3,307	4.7	168	9.2	881	48.2	56	35.9	136	87.2	224	11.3	1,017	51.2	785	1.1	4,324	6.0
	1994	567	0.8	3,397	5.0	181	9.9	891	48.5	47	28.7	150	91.5	228	11.4	1,041	52.0	795	1.1	4,438	6.3
	1995	543	0.8	3,187	4.9	196	11.0	852	47.9	52	36.9	135	95.7	248	12.9	987	51.4	791	1.2	4,174	6.2
	1996	501	0.8	2,937	4.7	194	10.2	944	49.9	32	27.1	111	94.1	226	11.2	1,055	52.5	727	1.1	3,992	6.1
	1997	566	0.9	3,179	5.1	214	11.0	1,030	53.0	46	27.1	153	90.0	260	12.3	1,183	55.9	826	1.3	4,362	6.8
	1998	540	0.9	3,086	4.9	248	11.4	1,148	52.5	60	35.3	153	90.0	308	13.1	1,301	55.2	848	1.3	4,387	6.8
	1999	569	0.9	3,082	5.0	231	10.8	1,124	52.6	49	32.9	138	92.6	280	12.3	1,262	55.2	849	1.3	4,344	6.8
	2000	555	0.9	3,096	5.1	204	9.4	1,097	50.7	49	38.0	125	96.9	253	11.0	1,222	53.3	808	1.3	4,318	6.9
	2001	576	1.0	3,147	5.2	235	10.7	1,156	52.4	41	31.3	120	91.6	276	11.8	1,276	54.6	852	1.4	4,423	7.0
Ages 35+	**1990**	106	1.0	558	5.1	25	6.8	160	43.8	7	24.1	26	89.7	32	8.1	186	47.2	138	1.2	744	6.6
	1991	105	1.0	545	5.0	34	8.1	181	42.9	1	--[3]	10	76.9	35	8.0	191	43.9	140	1.2	736	6.4
	1992	104	0.9	580	5.0	26	6.0	192	44.4	10	33.3	24	80.0	36	7.8	216	46.8	140	1.2	796	6.6
	1993	112	0.9	612	5.1	48	9.3	224	43.4	17	36.2	42	89.4	65	11.5	266	47.2	177	1.4	878	7.0
	1994	120	1.0	618	4.9	42	8.3	231	45.6	19	38.0	48	96.0	61	11.0	279	50.1	181	1.4	897	6.9
	1995	130	1.0	679	5.1	31	4.8	276	43.0	11	19.3	44	77.2	42	6.0	320	45.8	172	1.2	999	7.2
	1996	156	1.1	737	5.4	33	4.9	320	47.1	13	19.7	56	84.8	46	6.2	376	50.5	202	1.4	1,113	7.7
	1997	165	1.1	759	5.2	78	8.6	409	45.3	29	31.5	87	94.6	107	10.8	496	49.9	272	1.7	1,255	8.1
	1998	150	1.0	733	4.8	50	5.5	422	46.2	22	18.6	113	95.8	72	7.0	535	51.8	222	1.4	1,268	7.8
	1999	162	1.0	787	5.0	93	9.3	493	49.5	16	16.7	84	87.5	109	10.0	577	52.8	271	1.6	1,364	8.2
	2000	167	1.0	790	4.9	80	7.7	506	48.6	35	31.5	97	87.4	115	10.0	603	52.3	282	1.6	1,393	8.1
	2001	154	0.9	784	4.7	75	6.5	498	43.2	33	35.1	90	95.7	108	8.7	588	47.2	262	1.5	1,372	7.7

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Very Low Birthweight (VLBW): less than 1,500 grams (3.3 lbs.). 2. Low Birthweight (LBW): less than 2,500 grams (5.5 lbs.). 3. Calculations based on fewer than five events are excluded.

Table 16. Births by Gestational Age[1], Race and Hispanic Ethnicity, Massachusetts: 2001

Gestational Age	Total		Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian		Other[3]		Unknown
(weeks completed)	n	%[2]	n	%[2]	n	%[2]	n	%[2]	n	%[2]	n	%[2]	n
State Total	81,014	100.0	59,115	100.0	5,862	100.0	9,410	100.0	4,784	100.0	1,698	100.0	145
<20	19	0.0	12	0.0	5	0.1	2	--[7]	0	0.0	0	0.0	0
20-23	147	0.2	94	0.2	31	0.5	15	0.2	6	0.1	1	--[7]	0
24-27	321	0.4	186	0.3	55	0.9	52	0.6	18	0.4	8	0.5	3
28-31	737	0.9	490	0.8	101	1.7	98	1.0	39	0.8	7	0.4	2
32-35	2,889	3.6	2,048	3.5	291	5.0	350	3.7	127	2.7	72	4.2	1
36	2,298	2.8	1,652	2.8	223	3.8	259	2.8	111	2.3	53	3.1	0
37-39[4]	34,874	43.0	25,004	42.3	2,612	44.6	4,264	45.3	2,244	46.9	724	42.6	26
40[4]	27,985	34.5	20,958	35.5	1,725	29.4	3,057	32.5	1,669	34.9	549	32.3	27
41[4]	9,865	12.2	7,377	12.5	662	11.3	1,085	11.5	508	10.6	225	13.3	8
42[4]	1,267	1.6	896	1.5	121	2.1	164	1.7	48	1.0	36	2.1	2
43	36	0.0	21	0.0	6	0.1	6	0.1	2	--[7]	1	--[7]	0
44+	28	0.0	19	0.0	5	0.1	3	--[7]	1	--[7]	0	0.0	0
Unknown[5]	548	0.7	358	0.6	25	0.4	55	0.6	11	0.2	22	1.3	76
Very early gestation, <28 weeks	488	0.6	292	0.5	91	1.6	69	0.7	24	0.5	9	0.5	3
Preterm, <37 weeks[6]	6,412	8.0	4,482	7.6	706	12.1	776	8.3	301	6.3	141	8.4	6

NOTE: Percentages for detailed gestational age category rows ("<20" through "Unknown") are calculated based on all births including those with unknown gestational age. Percentages for "Very early gestation" and "Preterm" rows are calculated based on births with known gestational age only.

1. A clinical estimate of the number of weeks of pregnancy completed; as estimated by the attendant at birth or the postnatal physician. 2. Percentages are based on column total. 3. Other races include American Indian and others not specified. 4. Normal gestational age is defined as 37-42 weeks. 5. Estimate of gestational age not provided. 6. Also known as early gestational age, premature delivery, or preterm delivery. 7. Calculations based on fewer than five events are excluded.

CHAPTER 5

ADEQUACY OF PRENATAL CARE

IMPORTANT TECHNICAL NOTE:

Change in Adequacy of Prenatal Care Indicator in *Massachusetts Births 2001*:
(based on excerpts from "An Overview of the APNCU Index" by Milton Kotelchuck, Sept. 1994)

What is the APNCU Index, and why has it replaced the Kessner Index?
Beginning with this year's publication (*Massachusetts Births 2001*), adequacy of prenatal care is measured with the Adequacy of Prenatal Care Utilization (APNCU) Index instead of the Kessner Index, which has been used in previous *Advance Births* and *Massachusetts Births* publications. The APNCU Index was developed by Milton Kotelchuck, Ph.D. It is the standard used in Healthy People 2010 and by the majority of states. It improves upon the Kessner Index in various ways, the most important being the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to an insufficient number of prenatal care visits. [Please see the Technical Notes in the Appendix for more information on differences between the Kessner Index and the APNCU Index.]

What does the APNCU Index measure?
The APNCU Index characterizes prenatal care (PNC) utilization by measuring two distinct components of prenatal care -- adequacy of initiation and adequacy of received services (visits). Each of these components is measured as an independent index, and the APNCU Index is a summary of these 2 component indices. As with the Kessner Index, the APNCU Index does not assess quality of the prenatal care that is delivered, only its utilization.

Component Indices and Summary Index
The first component index is **"Adequacy of Initiation,"** which describes the adequacy of when prenatal care began during pregnancy. The assumption underlying this scale is that the earlier PNC begins the better. The month or trimester prenatal care begins is widely used as a measure to assess the adequacy of timing of initiation of PNC, since it accurately and succinctly describes when PNC begins. The APNCU Index uses this measure to determine the "adequacy of initiation."

The second component index, **"Adequacy of Received Services" (visits),** characterizes the adequacy of received PNC visits during the time period after prenatal care is begun until the delivery. This component attempts to characterize if the woman received the appropriate number of prenatal care visits for the time period in which she received PNC services. [The appropriate number of visits is based on recommendations of the American College of Obstetricians and Gynecologists for an uncomplicated pregnancy. For example, a woman beginning prenatal care during the first month of pregnancy who delivers during the 40th week of gestation (and has no complications with her pregnancy) should receive 14 visits.]

The two component indices are measured independently from one another, and can be used as separate indices, since the policy and practice issues underlying whether women are beginning care early and whether they are receiving the recommended amount of visits may be quite distinct. However, because of the popularity and utility of using one overall adequacy of PNC index, **the two component indices are combined into a single summary index -- the "Adequacy of Prenatal Care Utilization (APNCU) Index."**

Index Categories
Both the two component indices and the summary index (APNCU Index) characterize PNC as one of five categories: **"adequate intensive," "adequate basic," "intermediate," "inadequate," or "unknown."** The category "adequate basic" refers to the minimum recommended level of care (for a pregnancy with no complications), while "adequate intensive" refers to a level of care exceeding recommended standards. **The sum of the "adequate basic" and "adequate intensive" categories is the total adequacy score.** In addition, the "inadequate" category can be subdivided to isolate those women who received no PNC. *[For definitions of categories, please see the Technical Notes in the Appendix.]*

[For more detail on the methodology of the APNCU Index, please call the Bureau of Health Statistics, Research and Evaluation at 617-624-5643.]

Changes in Adequacy of Prenatal Care, 1996-2001

Adequacy of prenatal care as measured by the summary APNCU Index rose slightly from 1996 to 2001 in Massachusetts. In 1996, 83.3% received adequate prenatal care; in 2001, 85.2% received adequate prenatal care (Figure 13). Adequacy rates rose slightly for white non-Hispanic mothers, Asian mothers, and Hispanic mothers while staying about the same for black mothers. In 2001, white non-Hispanic women had the highest percentage of adequate prenatal care, 88.2%, followed by Asians (81.3%), Hispanics (77.0%), and non-Hispanic blacks (73.9%)

Components of the Adequacy of Prenatal Care Utilization Index

In Table 17, the two component indices, initiation and received services (visits), as well as the summary APNCU Index, are described. In 2001, the total percentage of mothers receiving adequate prenatal care ("adequate total") was 85.2%, including 48.2% of mothers who received "adequate basic" prenatal care (they began care in months 1-4 of pregnancy and received 80-109% of the expected number of prenatal visits), and 37.1% of mothers who received "adequate intensive" care (they began care in months 1-4 of pregnancy and received at least 110% of expected number of visits). Approximately 1 out of 12 mothers (8.1%) received inadequate prenatal care in Massachusetts in 2001.

More than 9 out of 10 Massachusetts mothers in 2001 (92.6%) had adequate initiation of PNC (Table 17). Half (50.3%) began care in the third or fourth month of pregnancy ("adequate basic" initiation) while 42.3% began care in the first or second month of pregnancy ("adequate intensive" initiation). The sum of these two groups (50.3% + 42.3%) equals the total adequacy score ("adequate total") of 92.6% on the adequacy of initiation index.

Almost half (49.6%) of mothers had 80-109% of the expected number of prenatal care visits ("adequate basic" visits) (Table 17). In addition, 41.9% of mothers had at least 110% of the expected number of prenatal care visits ("adequate intensive" visits). A total of 91.5% (49.6% + 41.9%) of mothers received an adequate number of prenatal care visits.

Adequacy of Prenatal Care Utilization by Selected Maternal and Infant Characteristics

Adequacy of prenatal care increased with both age and educational level of the mother. Almost 9 out of 10 women ages 40 and above received adequate prenatal care (89.5%); whereas, almost 1 in 4 women less than age 18 had inadequate prenatal care (24.0%) (Table 18). Women with more education were more likely to receive adequate prenatal care: 91.9% of mothers with more than a college degree had adequate prenatal care while only 70.7% of mothers with less than a high school education had adequate prenatal care. White non-Hispanic and Asian mothers had the highest adequacy levels, 88.2% and 81.4% respectively. Black non-Hispanic mothers had the lowest adequacy levels (74.0%). Mothers who smoked during their pregnancies were almost twice as likely to have inadequate prenatal care compared to non-smokers, 14.5% vs. 7.4%. Women who had multiple births were much more likely to receive adequate intensive services compared to mothers delivering only one child: 78.3% vs. 35.1%. This no doubt reflects the higher risk and potential complications for delivery of multiple births. Similarly, women who delivered prematurely (less than 37 weeks of gestation) were much more likely to have adequate intensive prenatal care than women who delivered at full term (37-42 weeks): 74.5% vs. 33.9%.

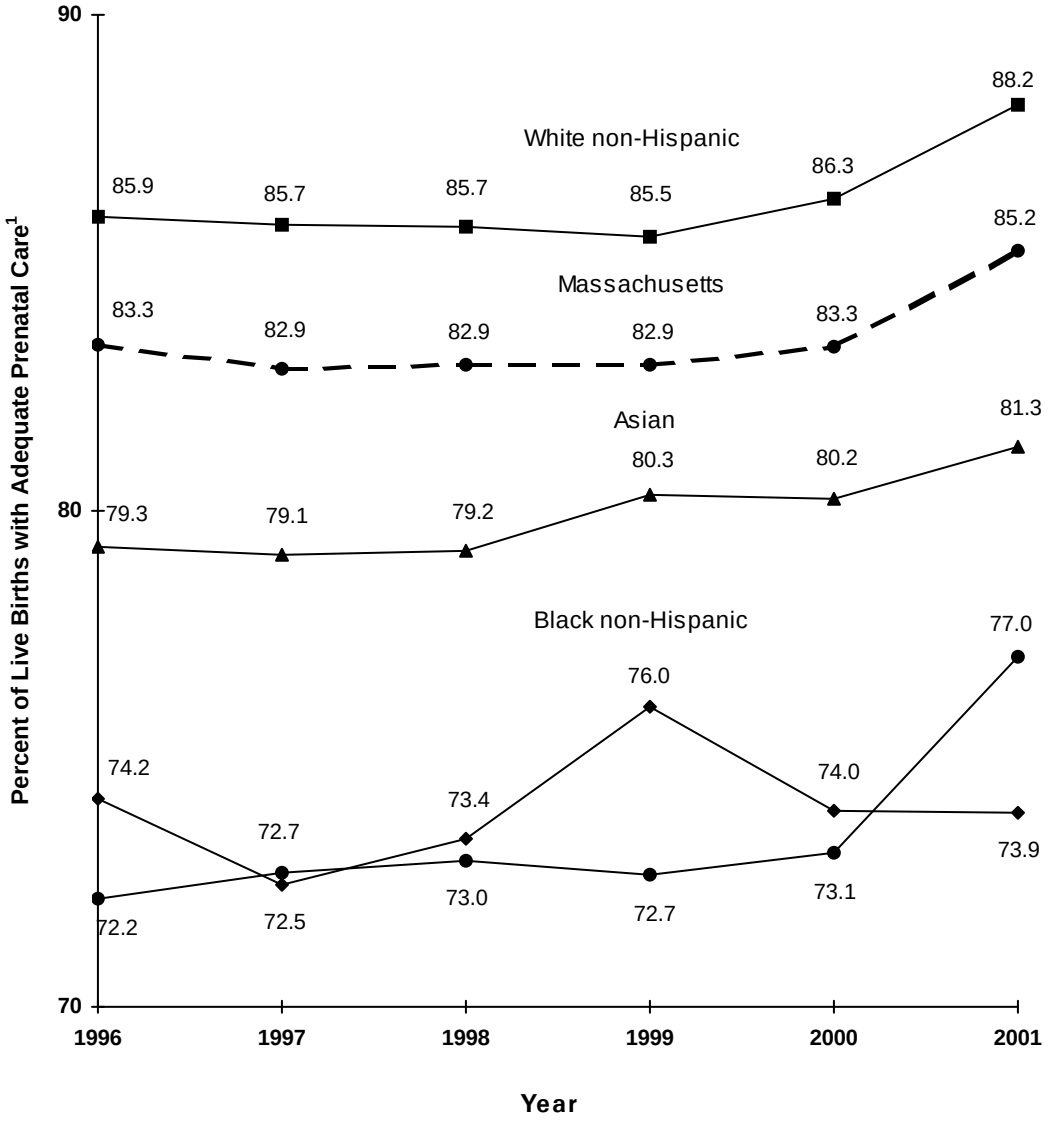
Adequacy of Initiation by Selected Maternal and Infant Characteristics

About 1 in 5 teenage mothers did not start prenatal care until their fifth month of pregnancy or had no prenatal care at all (Table 19) . (This is the sum of intermediate and inadequate initiation, which equals 23.0% for women less than 18 years old and 17.7% for women age 18-19.) Over 95% of mothers age 30 and above began prenatal care in their first four months of pregnancy (as reflected by their adequate total scores in Table 19). White non-Hispanic mothers were more likely to have adequate prenatal care initiation (95.0%) than black non-Hispanic mothers (83.8%), Hispanic women (86.2%), and Asian women (88.8%). Mothers who smoked were twice as likely to have inadequate prenatal care initiation compared to non-smoking mothers (5.1% vs. 2.5%). Mothers who delivered very low birth weight infants (birthweight < 1,500 g) were more likely to enter prenatal care in their first or second month of pregnancy (“adequate intensive”) than women who delivered heavier infants.

Adequacy of Received Services (Visits) by Selected Maternal and Infant Characteristics

Older mothers and better educated mothers had higher proportions of adequate PNC visits than younger or less educated mothers (Table 20). One exception to this pattern is for women under the age of 18 who had the highest level of adequate intensive prenatal care visits. U.S.-born mothers had the highest rate of adequate visits (92.0%), followed by non-US born (90.1%), and mothers born in Puerto Rico or other US territories (88.9%). More than 4 out of 5 women (81.6%) delivering multiple births had an adequate intensive number of visits (at least 110% of the expected number of prenatal care visits adjusted for the length of pregnancy) compared with 40.0% of women who gave birth to singletons. Women who delivered low birth weight infants (< 2500 g) were more likely to have adequate intensive services and also more likely to have inadequate services than women who delivered normal weight infants (2500+ g).

Figure 13. Trends in Adequacy of Prenatal Care[1] by Race and Hispanic Ethnicity, Massachusetts: 1996-2001



PLEASE NOTE THAT VERTICAL SCALE OF GRAPH REPRESENTS A SMALL INTERVAL FOR PURPOSES OF VISUAL REPRESENTATION.

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index.

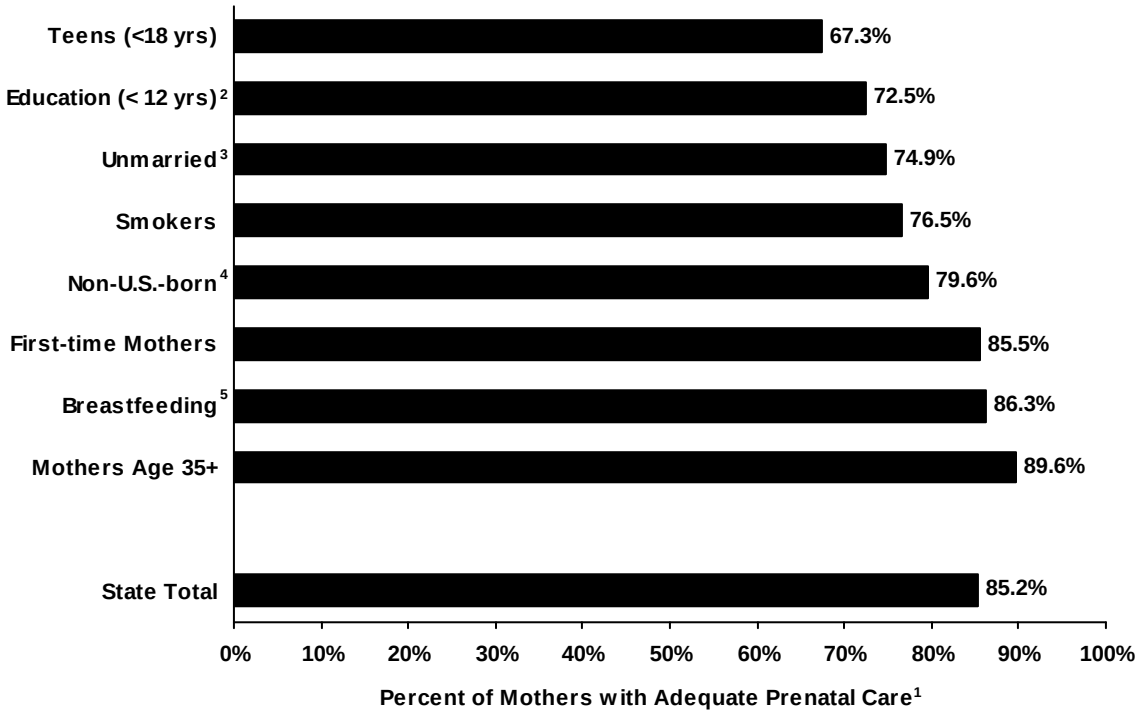
Table 17. Adequacy of Prenatal Care Utilization[1]: Summary and Component Indices, Massachusetts: 2001

	Adequate Total[2]		Adequate Intensive[3]		Adequate Basic[3]		Intermediate[3]		Inadequate[3]		Unknown[3]
	n	%	n	%	n	%	n	%	n	%	n
Summary Index[4]											
Adequacy of Prenatal Care Utilization	68,481	85.2	29,783	37.1	38,698	48.2	5,405	6.7	6,482	8.1	646
Component Indices[4]											
Adequacy of Initiation	74,433	92.6	33,969	42.3	40,464	50.3	3,725	4.6	2,210	2.7	646
Adequacy of Received Services (Visits)	73,508	91.5	33,635	41.9	39,873	49.6	5,971	7.4	889	1.1	646

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic categories. 3. For definitions of these categories, please see the Technical Notes in the Appendix. 4. For an explanation of the APNCU Index (summary index) and its component indices, please see the Technical Note at the beginning of this chapter.

Figure 14. Adequacy of Prenatal Care[1] for Selected Population Characteristics, Massachusetts: 2001



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 2. Women 20 years of age and older. 3. Marital status at time of birth. 4. Non-U.S.-born includes women born outside of the 50 U.S. states, District of Columbia, and U.S. territories (Puerto Rico, U.S. Virgin Islands, Guam). 5. Mother was or was intending to breastfeed at the time the birth certificate was completed.

Table 18. Adequacy of Prenatal Care[1] by Selected Characteristics, Massachusetts: 2001

	Adequate Total[2]		Adequate Intensive		Adequate Basic		Intermediate		Inadequate		Unknown
	n	%	n	%	n	%	n	%	n	%	n
State Total	**68,481**	**85.2%**	**29,783**	**37.1%**	**38,698**	**48.2%**	**5,405**	**6.7%**	**6,482**	**8.1%**	**646**
Age					**Maternal Demographics**						
<18	1,136	67.3%	564	33.4%	572	33.9%	146	8.7%	405	24.0%	18
18-19	2,380	71.7%	1,105	33.3%	1,275	38.4%	310	9.3%	628	18.9%	34
20-24	9,178	77.1%	4,159	34.9%	5,019	42.1%	1,035	8.7%	1,696	14.2%	120
25-29	16,024	85.0%	6,964	36.9%	9,060	48.1%	1,302	6.9%	1,525	8.1%	164
30-34	23,768	88.8%	9,875	36.9%	13,893	51.9%	1,639	6.1%	1,354	5.1%	187
35-39	13,143	89.7%	5,749	39.2%	7,394	50.5%	814	5.6%	699	4.8%	94
40+	2,851	89.5%	1,367	42.9%	1,484	46.6%	159	5.0%	175	5.5%	28
Educational Attainment											
< high school	5,687	70.7%	2,762	34.3%	2,925	36.3%	758	9.4%	1,604	19.9%	89
high school	17,141	81.2%	7,823	37.1%	9,318	44.2%	1,632	7.7%	2,325	11.0%	163
some college	15,949	86.0%	7,373	39.8%	8,576	46.3%	1,251	6.7%	1,339	7.2%	129
college	19,575	90.4%	7,823	36.1%	11,752	54.3%	1,203	5.6%	865	4.0%	128
more than college	10,018	91.9%	3,947	36.2%	6,071	55.7%	554	5.1%	332	3.0%	51
Race/Hispanic Ethnicity											
Hispanic	7,203	77.0%	3,232	34.6%	3,971	42.5%	754	8.1%	1,394	14.9%	89
White non-Hispanic	51,810	88.2%	22,291	37.9%	29,519	50.3%	3,720	6.3%	3,208	5.5%	377
Black non-Hispanic	4,276	74.0%	2,044	35.4%	2,232	38.6%	469	8.1%	1,037	17.9%	80
Asian	3,879	81.4%	1,659	34.8%	2,220	46.6%	307	6.4%	579	12.2%	19
Other	1,256	75.3%	532	31.9%	724	43.4%	155	9.3%	258	15.5%	29
Birthplace											
U.S. States/D.C.	52,531	87.1%	22,863	37.9%	29,668	49.2%	3,940	6.5%	3,806	6.3%	469
Puerto Rico/U.S. Terr.	1,736	77.4%	818	36.5%	918	40.9%	182	8.1%	324	14.5%	16
Non-U.S.-Born	14,139	79.6%	6,067	34.2%	8,072	45.4%	1,279	7.2%	2,345	13.2%	153
Parity[3]					**Pregnancy-Related Factors**						
1	29,805	85.5%	12,777	36.7%	17,028	48.9%	2,266	6.5%	2,783	8.0%	178
2-3	34,178	86.1%	14,922	37.6%	19,256	48.5%	2,714	6.8%	2,826	7.1%	180
4+	4,471	77.6%	2,071	35.9%	2,400	41.6%	424	7.4%	868	15.1%	55
Smoking[4]											
Yes	5,611	76.5%	2,729	37.2%	2,882	39.3%	655	8.9%	1,064	14.5%	57
No	62,775	86.1%	27,008	37.0%	35,767	49.0%	4,744	6.5%	5,401	7.4%	500
Plurality					**Birth Outcomes**						
Singleton	65,163	84.8%	26,998	35.1%	38,165	49.7%	5,332	6.9%	6,316	8.2%	598
Multiple birth	3,318	93.3%	2,785	78.3%	533	15.0%	73	2.1%	166	4.7%	48
Birthweight											
<500 g	83	83.0%	75	75.0%	8	8.0%	4	4.0%	13	13.0%	7
500-1,499 g	860	88.7%	760	78.4%	100	10.3%	22	2.3%	88	9.1%	37
1,499-2,499 g	4,002	86.3%	3,111	67.0%	891	19.2%	205	4.4%	433	9.3%	41
2,500-3,999 g	55,591	84.9%	23,131	35.3%	32,460	49.5%	4,502	6.9%	5,423	8.3%	292
4,000+ g	7,903	86.9%	2,683	29.5%	5,220	57.4%	669	7.4%	519	5.7%	36
Gestational Age											
<28 weeks	392	85.0%	347	75.3%	45	9.8%	19	4.1%	50	10.8%	26
<37 weeks	5,522	87.3%	4,717	74.5%	805	12.7%	246	3.9%	556	8.8%	87
37-42 weeks	62,674	85.1%	24,953	33.9%	37,721	51.2%	5,129	7.0%	5,887	8.0%	301

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth. 4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.

Table 19. Adequacy of Prenatal Care Initiation[1] by Selected Characteristics, Massachusetts: 2001

	Adequate Total[2]		Adequate Intensive		Adequate Basic		Intermediate		Inadequate		Unknown
	n	%	n	%	n	%	n	%	n	%	n
State Total	**74,433**	**92.6%**	**33,969**	**42.3%**	**40,464**	**50.3%**	**3,725**	**4.6%**	**2,210**	**2.7%**	**646**
Age					**Maternal Demographics**						
<18	1,299	77.0%	500	29.6%	799	47.4%	232	13.8%	156	9.2%	18
18-19	2,731	82.3%	1,087	32.8%	1,644	49.5%	365	11.0%	222	6.7%	34
20-24	10,332	86.8%	4,413	37.1%	5,919	49.7%	1,012	8.5%	565	4.7%	120
25-29	17,452	92.6%	8,187	43.4%	9,265	49.1%	878	4.7%	521	2.8%	164
30-34	25,550	95.5%	11,820	44.2%	13,730	51.3%	767	2.9%	444	1.7%	187
35-39	14,041	95.8%	6,545	44.7%	7,496	51.1%	377	2.6%	238	1.6%	94
40+	3,027	95.0%	1,416	44.5%	1,611	50.6%	94	3.0%	64	2.0%	28
Educational Attainment											
< high school	6,561	81.5%	2,567	31.9%	3,994	49.6%	927	11.5%	561	7.0%	89
high school	18,954	89.8%	8,506	40.3%	10,448	49.5%	1,356	6.4%	788	3.7%	163
some college	17,302	93.3%	7,886	42.5%	9,416	50.8%	777	4.2%	460	2.5%	129
college	20,886	96.5%	9,654	44.6%	11,232	51.9%	471	2.2%	286	1.3%	128
more than college	10,611	97.3%	5,314	48.7%	5,297	48.6%	186	1.7%	107	1.0%	51
Race/Hispanic Ethnicity											
Hispanic	8,056	86.2%	3,613	38.6%	4,443	47.5%	813	8.7%	482	5.2%	59
White non-Hispanic	55,821	95.0%	25,752	43.8%	30,069	51.2%	1,871	3.2%	1,046	1.8%	377
Black non-Hispanic	4,843	83.8%	2,220	38.4%	2,623	45.4%	551	9.5%	388	6.7%	80
Asian	4,229	88.8%	1,729	36.3%	2,500	52.5%	361	7.6%	175	3.7%	19
Other	1,427	85.5%	633	37.9%	794	47.6%	127	7.6%	115	6.9%	29
Birthplace											
U.S. States/D.C.	56,827	94.3%	26,129	43.3%	30,698	50.9%	2,269	3.8%	1,181	2.0%	469
Puerto Rico/U.S. Terr.	1,935	86.3%	892	39.8%	1,043	46.5%	200	8.9%	107	4.8%	16
Non-U.S.-Born	15,591	87.8%	6,908	38.9%	8,683	48.9%	1,253	7.1%	919	5.2%	153
Parity[3]					**Pregnancy-Related Factors**						
1	32,266	92.6%	14,890	42.7%	17,376	49.9%	1,557	4.5%	1,031	3.0%	178
2-3	37,168	93.6%	16,967	42.7%	20,201	50.9%	1,655	4.2%	895	2.3%	180
4+	4,971	86.3%	2,103	36.5%	2,868	49.8%	512	8.9%	280	4.9%	55
Smoking[4]											
Yes	6,357	86.7%	2,668	36.4%	3,689	50.3%	596	8.1%	377	5.1%	57
No	67,973	93.2%	31,255	42.9%	36,718	50.4%	3,120	4.3%	1,827	2.5%	500
Plurality					**Birth Outcomes**						
Singleton	71,022	92.5%	32,244	42.0%	38,778	50.5%	3,607	4.7%	2,182	2.8%	598
Multiple birth	3,411	95.9%	1,725	48.5%	1,686	47.4%	118	3.3%	28	0.8%	48
Birthweight											
<500 g	88	88.0%	50	50.0%	38	38.0%	7	7.0%	5	5.0%	7
500-1,499 g	890	91.8%	495	51.0%	395	40.7%	55	5.7%	25	2.6%	37
1,499-2,499 g	4,244	91.5%	2,057	44.3%	2,187	47.1%	237	5.1%	159	3.4%	41
2,500-3,999 g	60,538	92.4%	27,407	41.8%	33,131	50.6%	3,139	4.8%	1,839	2.8%	292
4,000+ g	8,628	94.9%	3,941	43.4%	4,687	51.6%	284	3.1%	179	2.0%	36
Gestational Age											
<28 weeks	415	90.0%	243	52.7%	172	37.3%	28	6.1%	18	3.9%	26
<37 weeks	5,816	92.0%	2,992	47.31%	2,824	44.7%	311	4.9%	197	3.1%	87
37-42 weeks	68,301	92.7%	30,824	41.8%	37,477	50.9%	3,396	4.6%	1,993	2.7%	301

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. Based on the Adequacy of Initiation Index, a component index of the APNCU Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth.
4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.

Table 20. Adequacy of Prenatal Care Visits[1] by Selected Characteristics, Massachusetts: 2001

	Adequate Total[2]		Adequate Intensive		Adequate Basic		Intermediate		Inadequate		Unknown
	n	%	n	%	n	%	n	%	n	%	n
State Total	**73,508**	**91.5%**	**33,635**	**41.9%**	**39,873**	**49.6%**	**5,971**	**7.4%**	**889**	**1.1%**	**646**
Age					**Maternal Demographics**						
<18	1,467	87.0%	815	48.3%	652	38.6%	179	10.6%	41	2.4%	18
18-19	2,880	86.8%	1,473	44.4%	1,407	42.4%	371	11.2%	67	2.0%	34
20-24	10,473	87.9%	5,121	43.0%	5,352	44.9%	1,202	10.1%	234	2.0%	120
25-29	17,225	91.4%	7,891	41.9%	9,334	49.5%	1,426	7.6%	200	1.1%	164
30-34	24,801	92.7%	10,703	40.0%	14,098	52.7%	1,755	6.6%	205	0.8%	187
35-39	13,679	93.3%	6,166	42.1%	7,513	51.3%	860	5.9%	117	0.8%	94
40+	2,982	93.6%	1,466	46.0%	1,516	47.6%	178	5.6%	25	0.8%	28
Educational Attainment											
< high school	5,687	70.7%	2,762	34.3%	2,925	36.3%	758	9.4%	1,604	19.9%	89
high school	17,141	81.2%	7,823	37.1%	9,318	44.2%	1,632	7.7%	2,325	11.0%	163
some college	15,949	86.0%	7,373	39.8%	8,576	46.3%	1,251	6.7%	1,339	7.2%	129
college	19,575	90.4%	7,823	36.1%	11,752	54.3%	1,203	5.6%	865	4.0%	128
more than college	10,018	91.9%	3,947	36.2%	6,071	55.7%	554	5.1%	332	3.0%	51
Race/Hispanic Ethnicity											
Hispanic	8,297	88.7%	4,060	43.4%	4,237	45.3%	890	9.5%	164	1.8%	59
White non-Hispanic	54,333	92.5%	24,241	41.3%	30,092	51.2%	3,943	6.7%	462	0.8%	377
Black non-Hispanic	5,021	86.8%	2,604	45.0%	2,417	41.8%	598	10.3%	163	2.8%	80
Asian	4,346	91.2%	2,028	42.6%	2,318	48.6%	359	7.5%	60	1.3%	19
Other	1,450	86.9%	675	40.4%	775	46.4%	181	10.8%	38	2.3%	29
Birthplace											
U.S. States/D.C.	55,437	92.0%	25,093	41.6%	30,344	50.3%	4,255	7.1%	585	1.0%	469
Puerto Rico/U.S. Terr.	1,994	88.9%	1,015	45.3%	979	43.7%	212	9.5%	36	1.6%	16
Non-U.S.-Born	15,998	90.1%	7,489	42.2%	8,509	47.9%	1,500	8.4%	265	1.5%	153
Parity[3]					**Pregnancy-Related Factors**						
1	32,059	92.0%	14,555	41.8%	17,504	50.2%	2,465	7.1%	330	0.9%	178
2-3	36,316	91.4%	16,535	41.6%	19,781	49.8%	2,978	7.5%	424	1.1%	180
4+	5,104	88.6%	2,530	43.9%	2,574	44.7%	527	9.1%	132	2.3%	55
Smoking[4]											
Yes	6,377	87.0%	3,290	44.9%	3,087	42.1%	763	10.4%	190	2.6%	57
No	67,025	91.9%	30,293	41.5%	36,732	50.4%	5,200	7.1%	695	1.0%	500
Plurality					**Birth Outcomes**						
Singleton	70,059	91.2%	30,731	40.0%	39,328	51.2%	5,890	7.7%	862	1.1%	598
Multiple birth	3,449	97.0%	2,904	81.6%	545	15.3%	81	2.3%	27	0.8%	48
Birthweight											
<500 g	90	90.0%	80	80.0%	10	10.0%	4	4.0%	6	6.0%	7
500-1,499 g	922	95.1%	809	83.4%	113	11.6%	24	2.5%	24	2.5%	37
1,499-2,499 g	4,329	93.3%	3,370	72.6%	959	20.7%	231	5.0%	80	1.7%	41
2,500-3,999 g	59,820	91.3%	26,371	40.3%	33,449	51.1%	4,995	7.6%	701	1.1%	292
4,000+ g	8,301	91.3%	2,978	32.8%	5,323	58.6%	714	7.9%	76	0.8%	36
Gestational Age											
<28 weeks	422	91.5%	370	80.3%	52	11.3%	19	4.1%	20	4.3%	26
<37 weeks	5,936	93.9%	5,059	80.00%	877	13.9%	279	4.4%	109	1.7%	87
37-42 weeks	67,263	91.3%	28,446	38.6%	38,817	52.7%	5,658	7.7%	769	1.0%	301

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.
1. Based on the Adequacy of Received Services (Visits) Index, a component index of the APNCU Index. See Glossary and Technical Notes in Appendix for definitions of Index and its categories. 2. Adequate Total is the sum of Adequate Intensive and Adequate Basic. 3. Parity is the number of live births including this birth. 4. Smoking during pregnancy is self-reported by the mother and should be interpreted with caution.

CHAPTER 6

PRENATAL CARE SOURCE OF PAYMENT

Prenatal Care Payment Source

In 2001, 71.3% of all Massachusetts women had their prenatal care paid for by private sources (commercial indemnity plans, commercial managed care organizations (HMO, PPO/IPP/IPA, etc.), or other private insurance (Figure 15)). Public entitlement programs, including Commonhealth, Medicaid/MassHealth and Healthy Start (a Massachusetts-funded program), covered the prenatal care expenses for 27.8% of Massachusetts women who gave birth in 2001. This percentage has increased each year since 1996 (24.2%), increasing by 15% between 1996 and 2001. Finally, less than 1% of mothers either paid for their prenatal care themselves (0.6%) or had their care paid for by other sources (0.4%).

Characteristics of Women Who Use Publicly Financed and Privately Insured Prenatal Care

Maternal and birth characteristics vary according to whether prenatal care was financed through public programs or through private insurance. Differences in characteristics between those served by public programs and those covered by private insurance may reflect different levels of risk rather than the quality of care received. Among women whose prenatal care was funded by Medicaid/MassHealth, 17.9% were under the age of 20. In contrast, only 2.0% of women whose prenatal care was privately insured were under age 20 (Table 21).

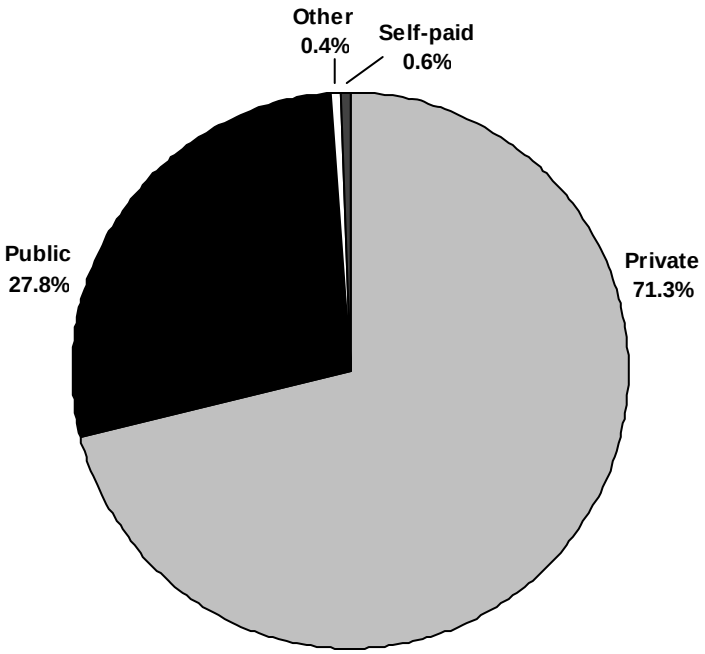
Overall, women whose prenatal care was publicly funded had a higher proportion of low birthweight deliveries (8.2%) than women whose prenatal care was privately insured (6.5%). However, this relationship between prenatal care payment source and low birthweight varied by race/ethnicity (Table 21). White non-Hispanic and Asian women with publicly financed prenatal care were more likely to have low birthweight deliveries compared to those with private insurance. However, among black non-Hispanic women, there was little difference in low birthweight delivery based on prenatal care insurance source (10.7% for public sources; 11.1% for private sources). Hispanic women with private insurance were somewhat more likely to have low birthweight delivery (8.6%) compared to those with publicly financed insurance (7.9%).

Women whose prenatal care was publicly financed were less likely to receive adequate prenatal care. This was true overall and within each race/ethnicity group. For example, 65.9% of non-Hispanic black women whose prenatal care was publicly financed received adequate prenatal care, while 87.3% of non-Hispanic black women with private insurance received adequate prenatal care (Table 21).

Overall, women with publicly funded prenatal care were less likely to deliver by Cesarean section (22.1%), compared to women with private insurance (27.0%). This was true for all race/ethnicity groups (Table 21). Asian women had the lowest Cesarean section rate compared to all other race/ethnicity groups among both those with publicly funded prenatal care (15.7%) and those with private insurance (24.4%).

Women of all race/ethnicity groups whose prenatal care was publicly funded were less likely to report breastfeeding or the intent to breastfeed (66.0%) compared to women who had private insurance (79.1%). Among Asian women, for example, 62.8% of those whose prenatal care was publicly funded reported the intent to breastfeed compared to 85.8% of those whose prenatal care was privately financed (Table 21).

Figure 15. Distribution of Prenatal Care Payment Source[1], Massachusetts: 2001



NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. Private: Commercial indemnity plan, commercial managed care (HMO, PPO, IPP, IPA, and other), or other private insurance. Public: Government programs including Commonhealth, Healthy Start, Medicaid/MassHealth, and Medicare (may also be HMO or managed care), or free care. Other: Worker's Compensation and other sources.

Table 21. Birth Characteristics by Source of Prenatal Care Payment, Race and Hispanic Ethnicity, Massachusetts: 2001

Race, Ethnicity, and Payment Source	Births[1]		Teen Births				Birthweight			
			<18 Years		<20 Years		Very Low[2]		Low[3]	
	n	%	n	%	n	%	n	%	n	%
STATE TOTAL[4]	**81,014**	**100.0**	**1,705**	**2.1**	**5,057**	**6.2**	**1,114**	**1.4**	**5,795**	**7.2**
Public	22,019	27.8	1,265	5.7	3,747	17.0	335	1.5	1,799	8.2
Medicaid[5]	18,729	23.6	1,125	6.0	3,350	17.9	288	1.5	1,564	8.4
Other Public[6]	3,290	4.1	140	4.3	397	12.1	47	1.4	235	7.1
Private[7]	56,518	71.3	390	0.7	1,158	2.0	661	1.2	3,660	6.5
Non-Hispanic White	**59,115**	**100.0**	**634**	**1.1**	**2,335**	**3.9**	**690**	**1.2**	**3,883**	**6.6**
Public	10,013	17.4	389	3.9	1,526	15.2	111	1.1	760	7.6
Medicaid[5]	8,921	15.5	365	4.1	1,435	16.1	101	1.1	692	7.8
Other Public[6]	1,092	1.9	24	2.2	91	8.3	10	0.9	68	6.2
Private[7]	47,208	81.8	222	0.5	728	1.5	491	1.0	2,871	6.1
Non-Hispanic Black	**5,862**	**100.0**	**240**	**4.1**	**636**	**10.8**	**188**	**3.2**	**654**	**11.2**
Public	3,409	58.9	194	5.7	485	14.2	95	2.8	366	10.7
Medicaid[5]	2,842	49.1	172	6.1	427	15.0	82	2.9	311	10.9
Other Public[6]	567	9.8	22	3.9	58	10.2	13	2.3	55	9.7
Private[7]	2,321	40.1	45	1.9	139	6.0	79	3.4	258	11.1
Hispanic	**9,410**	**100.0**	**671**	**7.1**	**1,653**	**17.6**	**161**	**1.7**	**775**	**8.2**
Public	6,464	69.1	561	8.7	1,412	21.8	103	1.6	509	7.9
Medicaid[5]	5,169	55.2	478	9.2	1,193	23.1	82	1.6	416	8.0
Other Public[6]	1,295	13.8	83	6.4	219	16.9	21	1.6	93	7.2
Private[7]	2,742	29.3	93	3.4	200	7.3	51	1.9	237	8.6
Asian	**4,784**	**100.0**	**85**	**1.8**	**221**	**4.6**	**52**	**1.1**	**348**	**7.3**
Public	1,216	25.6	65	5.3	167	13.7	15	1.2	101	8.3
Medicaid[5]	1,069	22.5	58	5.4	155	14.5	15	1.4	91	8.5
Other Public[6]	147	3.1	7	4.8	12	8.2	0	0.0	10	6.8
Private[7]	3,476	73.3	17	0.5	49	1.4	35	1.0	238	6.8
Other[9]	**1,698**	**100.0**	**71**	**4.2**	**201**	**11.8**	**18**	**1.1**	**127**	**7.5**
Public	905	54.3	56	6.2	154	17.0	11	1.2	63	7.0
Medicaid[5]	718	43.1	52	7.2	137	19.1	8	1.1	54	7.5
Other Public[6]	187	11.2	4	--[8]	17	9.1	3	--[8]	9	4.8
Private[7]	731	43.9	13	1.8	42	5.7	5	0.7	54	7.4

Table 21 (cont'd). Birth Characteristics by Source of Prenatal Care Payment, Race, and Hispanic Ethnicity, Massachusetts: 2001

Race, Ethnicity, and Payment Source	Prenatal Care: Adequate[9] n	Adequate[9] %	Began 1st Trimester n	Began 1st Trimester %	Cesarean Section n	Cesarean Section %	Breastfeeding[10] n	Breastfeeding[10] %
STATE TOTAL[4]	**68,481**	**85.2**	**67,821**	**84.3**	**20,639**	**25.6**	**59,911**	**75.3**
Public	16,062	73.4	15,560	71.0	4,861	22.1	14,534	66.0
Medicaid[5]	13,896	74.6	13,436	72.0	4,078	21.8	11,886	63.5
Other Public[6]	2,166	66.6	2,124	64.9	783	23.8	2,648	80.5
Private[7]	50,813	90.1	50,675	89.9	15,276	27.0	44,686	79.1
Non-Hispanic White	**51,810**	**88.2**	**51,723**	**88.0**	**15,456**	**26.2**	**42,978**	**74.3**
Public	7,637	76.7	7,447	74.7	2,294	22.9	5,797	57.9
Medicaid[5]	6,839	77.1	6,644	74.8	1,998	22.4	4,962	55.6
Other Public[6]	798	73.5	803	73.7	296	27.1	835	76.5
Private[7]	42,813	90.9	42,930	91.1	12,759	27.0	36,765	77.9
Non-Hispanic Black	**4,276**	**74.0**	**4,136**	**71.2**	**1,607**	**27.5**	**4,416**	**75.8**
Public	2,212	65.9	2,157	63.8	841	24.7	2,407	70.6
Medicaid[5]	1,927	68.6	1,875	66.5	688	24.2	1,948	68.6
Other Public[6]	285	51.7	282	50.5	153	27.0	459	81.0
Private[7]	2,013	87.3	1,926	83.4	732	31.6	1,947	83.9
Hispanic	**7,203**	**77.0**	**6,939**	**74.1**	**2,063**	**21.9**	**7,336**	**78.1**
Public	4,754	74.0	4,582	71.1	1,307	20.2	4,865	75.3
Medicaid[5]	3,861	75.0	3,734	72.4	1,048	20.3	3,795	73.4
Other Public[6]	893	69.6	848	65.8	259	20.0	1,070	82.7
Private[7]	2,347	85.9	2,264	82.8	729	26.6	2,341	85.4
Asian	**3,879**	**81.4**	**3,716**	**77.9**	**1,055**	**22.1**	**3,794**	**79.8**
Public	845	69.8	754	62.2	191	15.7	764	62.8
Medicaid[5]	759	71.3	675	63.3	170	15.9	649	60.7
Other Public[6]	86	58.9	79	54.1	21	14.3	115	78.2
Private[7]	2,977	85.8	2,904	83.6	849	24.4	2,979	85.8
Other[11]	**1,256**	**75.3**	**1,254**	**74.9**	**435**	**25.7**	**1,341**	**80.1**
Public	604	67.4	611	67.8	223	24.6	693	76.7
Medicaid[5]	501	70.4	500	70.0	169	23.5	526	73.4
Other Public[6]	103	56.0	111	59.4	54	28.9	167	89.3
Private[7]	626	86.1	618	85.0	196	26.8	619	84.8

NOTE: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated.

1. In the "Births" category, percentages are based on race/ethnicity totals (group column). For all other categories, percentages are based on Birth totals (row total) excluding unknowns for each characteristic. 2. Very low birthweight: less than 1,500 grams or 3.3 pounds. 3. Low Birthweight: less than 2,500 grams or 5.5 pounds. 4. Total births does not equal Public + Private. Other categories of prenatal care payment are also included in Total: Workers' Compensation, self-paid, and other. 5. Medicaid/MassHealth. 6. Other Public: Commonhealth, Healthy Start, Medicare, other government programs, and free care. 7. Private: commercial indemnity plans or commercial managed care org. (HMO, PPO, IPP, or IPA). 8. Calculations based on fewer than five events are excluded. 9. Based on the Adequacy of Prenatal Care Utilization (APNCU) Index. 10. Mother was intending to breastfeed at the time the birth certificate was completed. 11. Other: Mothers who designated their race as American Indian or Other.

CHAPTER 7

CESAREAN SECTION DELIVERIES BY HOSPITAL

Cesarean Section[1] Delivery by Facility

Cesarean section was the method of delivery for 25.7% of the live births occurring in Massachusetts ("occurrence births") in 2001 (Table 22), up 8% from the 2000 rate of 23.9% (data not shown). Since 1997, there has been a 30% increase in the percentage of Cesarean section deliveries in Massachusetts, from 19.8% in 1997 to 25.7% in 2001, after a steady decline in C-sections from 1990 (22.5%) to 1997 (19.8%) (data not shown). Calculations are based on births with known method of delivery. Note: facility-specific highlights in this chapter focus on facilities with at least 40 births in the category of interest. Data for all facilities are provided in Tables 22 and 23.

In 2001, five facilities had Cesarean section delivery rates of less than 20%: Tobey Hospital, Mercy Medical Center, Heywood Hospital, Franklin Medical Center, and Saint Vincent Hospital (Table 22). Thirteen hospitals had Cesarean section delivery rates from 25%-30% (Boston Medical Center, Brigham and Women's Hospital, Caritas Good Samaritan Medical Center, Falmouth Hospital, Harrington Memorial Hospital, Mary Lane Hospital, Massachusetts General Hospital, Morton Hospital, New England Medical Center Hospital, Newton-Wellesley Hospital, Saints Memorial Medical Ctr., South Shore Hospital, Sturdy Memorial Hospital, and Winchester Hospital). Seven hospitals had Cesarean section rates of more than 30%: Martha's Vineyard Hospital, Beth Israel Deaconess Medical Center, Fairview Hospital, Melrose-Wakefield Hospital, St. Elizabeth's Medical Center, Holy Family Hospital and Medical Center, and Emerson Hospital.

Primary Cesarean section delivery rates were lowest at Tobey Hospital, Mercy Medical Center, Heywood Hospital, Saint Vincent Hospital, Franklin Medical Center, Leominster Hospital, and Charlton Memorial Hospital, ranging from 9.0% for Tobey Hospital to 14.3% for Charlton Memorial Hospital. Primary Cesarean section delivery rates were over 20% at eleven hospitals: Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, Caritas Good Samaritan Medical Center, Emerson Hospital, Holy Family Hospital and Medical Center, Melrose-Wakefield Hospital, New England Medical Center Hospital, Newton-Wellesley Hospital, Saints Memorial Medical Ctr., St. Elizabeth's Medical Center, and UMass Memorial Medical Center-West Campus (Table 22).

Repeat Cesarean section delivery rates were lowest at Cooley Dickinson Hospital (65.1%) Saint Vincent Hospital (65.6%). Hospitals with high rates of repeat Cesarean section deliveries include: Massachusetts General Hospital (98.9%), North Shore Medical Center – Salem Hospital (91.6%), Holy Family Hospital and Medical Center (89.9%), and Saints Memorial Medical Ctr. (89.7%) (Table 22).

[1] Percentages of delivery by method in Table 16 are calculated in following manner:

- Percentage of total Cesarean sections = (Total Cesarean Births / All Births) x 100.
- Percentage primary Cesarean sections = (Primary Cesarean Sections / (All Births - Repeat Cesarean Sections - VBACs)) x 100.
- Percentage repeat Cesarean sections = (Repeat Cesarean Sections / (Repeat Cesarean Sections + VBACs)) x 100.
- Percentage of vaginal birth after Cesarean section delivery, that is, VBACs = (VBAC deliveries / (Repeat Cesarean Sections + VBAC)) x 100. Please note: the sum of the percentages of repeat Cesarean section deliveries + VBACs = 100% of all deliveries of mothers with a prior Cesarean section.

Cesarean Section Deliveries for Singleton Births

Cesarean section was the method of delivery for 25.8% of singleton births to mothers who gave birth to their first child in a Massachusetts licensed maternity facility in 2001 (Table 23). Heywood Hospital, Lawrence General Hospital, Saint Vincent Hospital, Mercy Medical Center, and Charlton Memorial Hospital had the lowest rates: 19.8%, 20.1%, 20.1%, 20.3% and 20.3% respectively. Melrose-Wakefield Hospital, Emerson Hospital, Caritas Good Samaritan Medical Center, Holy Family Hospital and Medical Center, and Beth Israel Deaconess Medical Center had the highest rates: 33.6%, 32.8%, 32.1%, 32.1%, and 32.0%, respectively.

Cesarean section was the method of delivery for 8.1% of singleton births to mothers having their second or later birth who had no prior Cesarean section. Metrowest Medical Center, Charlton Memorial Hospital, South Shore Hospital, and Mercy Medical Center had the lowest rates: 4.9%, 5.7%, 6.1% and 6.2% respectively (Table 23). UMass Memorial Medical Center-West Campus and Boston Medical Center had the highest rates: 15.9% and 13.8% respectively. Cesarean section was the method of delivery for 80.2% of the singleton births to mothers having their second or later birth who had prior Cesarean sections. Saint Vincent Hospital and Cooley Dickinson Hospital had the lowest rates: 63.9% and 64.6%. Massachusetts General Hospital and Saints Memorial Medical Ctr. had the highest rates: 99.2% and 92.1% respectively (Table 23).

Vaginal Birth after Cesarean Section (VBAC) Deliveries

In 2001, among women with a previous Cesarean section, 19.2% (1,756) had a vaginal birth after a Cesarean section delivery (VBAC) (Table 22). In 2000, 24.7% (2,139) had a VBAC, and in 1999, 28.2% (2,461) had a VBAC. In 1996, the VBAC rate peaked, at 34.0% (trend data not shown).

Since the sum of the percentage of repeat cesarean section deliveries and VBACs equals 100% of all births to mothers with a prior Cesarean section, facilities with the lowest repeat Cesarean section delivery rates had the highest VBAC rates. In total, only one hospital had a VBAC rate over 40%, compared with two in 2000, four in 1999, and thirteen in 1998. The hospital with a VBAC rate over 40% in 2001 was Franklin Medical Center.

Table 22. Cesarean Section Deliveries and Vaginal Births after Cesarean Section (VBACs) by Licensed Maternity Facility[1], All Births, Massachusetts: 2001

Facility	Occurrence Births[2]	Total C-Sections		Primary C-Section[2]		Repeat C-Section[2]		VBACs[2]	
		n	%[3,4]	n	%[3,5]	n	%[3,6]	n	%[7]
STATE TOTAL	**82,238**	**21,058**	**25.7**	**13,668**	**18.8**	**7,390**	**80.8**	**1,756**	**19.2**
Anna Jaques Hospital	1,111	277	24.9	185	18.5	92	82.1	20	17.9
Baystate Medical Center	4,526	1,114	24.6	704	17.8	410	72.2	158	27.8
Berkshire Medical Center	778	169	21.7	97	14.5	72	67.3	35	32.7
Beth Israel Deaconess Medical Center	4,956	1,589	32.1	1,091	25.1	498	81.1	116	18.9
Beverly Hospital	2,428	533	22.3	333	15.8	200	69.7	87	30.3
Boston Medical Center	1,932	498	25.8	333	19.3	165	78.9	44	21.1
Brigham and Women's Hospital	9,980	2,666	26.8	1,809	20.5	857	77.1	254	22.9
Brockton Hospital	1,417	336	23.7	224	17.7	112	75.2	37	24.8
Cambridge Hospital	809	198	24.5	112	15.8	86	85.1	15	14.9
Cape Cod Hospital	1,033	248	24.0	151	17.0	97	67.8	46	32.2
Caritas Good Samaritan Medical Center	978	288	29.4	184	21.5	104	86.0	17	14.0
Caritas Norwood Hospital	574	142	24.7	88	17.5	54	75.0	18	25.0
Charlton Memorial Hospital	1,703	361	21.2	219	14.3	142	83.0	29	17.0
Cooley Dickinson Hospital	902	202	22.4	148	18.1	54	65.1	29	34.9
Emerson Hospital	1,454	437	30.1	261	20.9	176	85.9	29	14.1
Fairview Hospital	166	53	31.9	33	23.2	20	83.3[8]	4	--[9]
Falmouth Hospital	636	157	25.7	95	17.8	62	81.6	14	18.4
Franklin Medical Center	467	87	18.6	59	14.0	28	59.6	19	40.4
Hale Hospital	122	34	27.9	21	19.8	13	81.3[8]	3	--[9]
Harrington Memorial Hospital	482	131	27.2	83	19.9	48	75.0	16	25.0
Heywood Hospital	649	120	18.5	71	12.3	49	68.1	23	31.9
Holy Family Hospital and Medical Center	1,477	449	30.4	307	23.3	142	89.9	16	10.1
Holyoke Hospital	412	87	21.1	54	14.5	33	84.6[8]	6	15.4[8]
Jordan Hospital	779	173	22.3	112	16.3	61	67.8	29	32.2
Lawrence General Hospital	1,488	367	24.7	189	14.8	178	85.2	31	14.8
Leominster Hospital	1,312	288	22.4	159	14.0	129	84.3	24	15.7
Lowell General Hospital	2,116	499	23.6	302	16.1	197	82.4	42	17.6
Martha's Vineyard Hospital	119	39	32.8	21	21.6	18	81.8[8]	4	--[9]
Mary Lane Hospital	214	59	27.6	36	19.1	23	88.5[8]	3	--[9]

Table 22 (cont'd). Cesarean Section Deliveries and Vaginal Births After Cesarean Section (VBACs) by Licensed Maternity Facility[1], All Births, Massachusetts: 2001

Facility	Occurrence Births[2]	Total C-Sections		Primary C-Section[2]		Repeat C-Section[2]		VBACs[2]	
		n	%[3,4]	n	%[3,5]	n	%[3,6]	n	%[7]
Massachusetts General Hospital	3,402	871	25.6	604	19.3	267	98.9	3	--[9]
Melrose-Wakefield Hospital	1,889	596	31.6	392	23.8	204	84.6	37	15.4
Mercy Medical Center	1,270	226	17.8	139	12.1	87	73.1	32	26.9
Metrowest Medical Center-Framingham Union Campus	2,348	583	24.9	373	17.7	210	86.4	33	13.6
Milford-Whitinsville Regional Hospital	922	225	24.4	140	17.0	85	85.9	14	14.1
Morton Hospital	687	192	28.0	119	19.8	73	84.9	13	15.1
Mount Auburn Hospital	1,431	332	23.3	227	17.6	105	75.5	34	24.5
Nantucket Cottage Hospital	79	19	24.1	16	21.1	3	--[9]	0	0.0
New England Medical Center Hospital	1,486	416	28.0	292	21.8	124	85.5	21	14.5
Newton Wellesley Hospital	3,216	923	28.7	573	20.3	350	89.3	42	10.7
North Adams Regional Hospital	308	71	23.1	38	14.0	33	89.2[8]	4	--[9]
North Shore Medical Center - Salem Hospital	1,730	398	23.0	246	15.7	152	91.6	14	8.4
Saint Vincent Hospital	1,815	352	19.4	226	13.9	126	65.6	66	34.4
Saints Memorial Medical Ctr.	715	204	28.6	134	21.1	70	89.7	8	10.3
South Shore Hospital	3,780	1,068	28.3	634	19.3	434	86.5	68	13.5
St. Elizabeth's Medical Center	1,583	499	31.5	315	23.3	184	80.3	45	19.7
St. Luke's Hospital	1,492	367	24.8	216	16.7	151	80.3	37	19.7
Sturdy Memorial Hospital	1,111	301	27.1	189	19.3	112	83.6	22	16.4
Tobey Hospital	509	82	16.1	41	9.0	41	80.4	10	19.6
UMass Memorial Medical Center-West Campus	4,462	1,083	24.3	892	21.1	191	82.7	40	17.3
Winchester Hospital	2,407	648	27.7	380	18.7	268	87.9	37	12.1

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001.

1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. See Glossary for definitions of occurrence births, primary and repeat Cesarean sections, and VBACs. The percentages provided in this table are based on occurrence births and may differ from data presented elsewhere in this book which are based on resident births. 3. The percentage of Cesarean births reported is not adjusted for risk factors such as mother's age, birthweight, or complications of labor and delivery, which would influence the number of procedures in a particular facility. Caution should be used when comparing unadjusted percentages. 4. Percentage of total Cesarean sections= (total Cesarean births/all births) x 100. 5. Percentage primary Cesarean sections=(primary Cesarean sections/all births-repeat Cesarean sections-VBACs) x 100. 6. Percentage repeat Cesarean sections= (repeat Cesarean sections/(repeat Cesarean sections + VBACs)) x100. 7. Percentage VBACs= (VBAC deliveries/(repeat Cesarean sections + VBAC)) x 100. 8. This percentage is based on less than 40 total births (in denominator) and should be interpreted with caution. 9. Calculations based on fewer than five events are excluded.

Table 23. Cesarean Section Deliveries for Singleton Births by Licensed Maternity Facility[1] and Number of Previous Births, Massachusetts: 2001

Facility	First Birth			Second or Later Birth without prior C-section			Second or Later Birth with prior C-section		
	Births[2]	C-section		Births[2]	C-section		Births[2]	C-section	
		n	%[3]		n	%[3]		n	%[3]
STATE TOTAL	**34,537**	**8,907**	**25.8**	**35,016**	**2,841**	**8.1**	**8,663**	**6,944**	**80.2**
Anna Jaques Hospital	470	118	25.1	499	52	10.4	108	88	81.5
Baystate Medical Center	1,704	416	24.4	2,031	164	8.1	548	391	71.4
Berkshire Medical Center	303	66	21.8	348	23	6.6	107	72	67.3
Beth Israel Deaconess Medical Center	2,103	672	32.0	1,861	162	8.7	565	456	80.7
Beverly Hospital	979	225	23.0	1,057	68	6.4	274	187	68.2
Boston Medical Center	828	194	23.4	842	116	13.8	192	149	77.6
Brigham and Women's Hospital	4,347	1,115	25.6	3,839	289	7.5	991	750	75.7
Brockton Hospital	631	157	24.9	592	50	8.4	146	109	74.7
Cambridge Hospital	411	96	23.4	290	12	4.1	97	82	84.5
Cape Cod Hospital	429	101	23.5	427	30	7.0	141	95	67.4
Caritas Good Samaritan Medical Center	349	112	32.1	482	52	10.8	121	104	86.0
Caritas Norwood Hospital	256	68	26.6	236	16	6.8	72	54	75.0
Charlton Memorial Hospital	750	152	20.3	748	43	5.7	161	133	82.6
Cooley Dickinson Hospital	429	110	25.6	363	19	5.2	82	53	64.6
Emerson Hospital	610	200	32.8	613	45	7.3	193	164	85.0
Fairview Hospital	80	27	33.8	60	4	--[5]	24	20	83.3[4]
Falmouth Hospital	253	64	25.3	264	22	8.3	72	58	80.6
Franklin Medical Center	195	42	21.5	208	9	4.3	45	27	60.0
Hale Hospital	48	8	16.7	56	11	19.6	16	13	81.3[4]
Harrington Memorial Hospital	196	59	30.1	212	17	8.0	62	46	74.2
Heywood Hospital	253	50	19.8	311	13	4.2	70	47	67.1
Holy Family Hospital and Medical Center	620	199	32.1	640	62	9.7	151	135	89.4
Holyoke Hospital	175	34	19.4	186	12	6.5	39	33	84.6[4]
Jordan Hospital	322	84	26.1	348	16	4.6	89	61	68.5
Lawrence General Hospital	556	112	20.1	688	48	7.0	205	174	84.9
Leominster Hospital	482	107	22.2	627	40	6.4	145	122	84.1
Lowell General Hospital	836	197	23.6	975	66	6.8	231	189	81.8
Martha's Vineyard Hospital	56	16	28.6	41	5	12.2	18	14	77.8[4]
Mary Lane Hospital	82	31	37.8	104	5	4.8	26	23	88.5[4]

Table 23 (cont'd). Cesarean Section Deliveries for Singleton Births by Licensed Maternity Facility and Number of Previous Births, Massachusetts: 2001

Facility	First Birth			Second or Later Birth without prior C-section			Second or Later Birth with prior C-section		
	Births[2]	C-section		Births[2]	C-section		Births[2]	C-section	
		n	%[3]		n	%[3]		n	%[3]
Massachusetts General Hospital	1,579	391	24.8	1,384	122	8.8	253	251	99.2
Melrose-Wakefield Hospital	783	263	33.6	813	97	11.9	234	197	84.2
Mercy Medical Center	479	97	20.3	660	41	6.2	113	81	71.7
Metrowest Medical Center-Framingham Union Campus	1,093	280	25.6	930	46	4.9	238	205	86.1
Milford-Whitinsville Regional Hospital	402	103	25.6	395	27	6.8	99	85	85.9
Morton Hospital	300	87	29.0	286	24	8.4	85	72	84.7
Mount Auburn Hospital	666	150	22.5	580	54	9.3	139	105	75.5
Nantucket Cottage Hospital	43	12	27.9	33	4	--[5]	3	3	--[5]
New England Medical Center Hospital	570	170	29.8	637	56	8.8	123	104	84.6
Newton Wellesley Hospital	1,297	402	31.0	1,413	103	7.3	383	345	90.1
North Adams Regional Hospital	129	32	24.8	140	6	4.3	33	29	87.9[4]
North Shore Medical Center - Salem Hospital	732	165	22.5	776	55	7.1	152	138	90.8
Saint Vincent Hospital	791	159	20.1	802	57	7.1	183	117	63.9
Saints Memorial Medical Ctr.	347	97	28.0	266	25	9.4	76	70	92.1
South Shore Hospital	1,472	448	30.4	1,683	102	6.1	480	412	85.8
St. Elizabeth's Medical Center	658	194	29.5	587	55	9.4	217	172	79.3
St. Luke's Hospital	574	145	25.3	679	53	7.8	184	147	79.9
Sturdy Memorial Hospital	431	135	31.3	525	44	8.4	132	110	83.3
Tobey Hospital	200	25	12.5	244	10	4.1	47	37	78.7
UMass Memorial Medical Center-West Campus	2,102	481	22.9	1,914	304	15.9	203	165	81.3
Winchester Hospital	962	238	24.7	994	85	8.6	287	250	87.1

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001.

1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. Occurrence births (See Glossary for definition.) 3. The percentage of Cesarean births reported is not adjusted for risk factors such as mother's age, birthweight, or complications of labor and delivery, which would influence the number of procedures in a particular facility. Caution should be used when comparing unadjusted percentages. 4. This percentage is based on less than 40 total births (in denominator) and should be interpreted with caution. 5. Calculations based on fewer than five events are excluded.

CHAPTER 8

BIRTHS BY HOSPITAL AND COMMUNITY

In 2001, 82,238 births occurred in Massachusetts, a decrease of 13% since 1990 (Table 24). *(Please note: the percentages and rates provided in Tables 22, 23, and 24 are based on occurrence births and differ from data presented elsewhere in this report, which are based on resident births. See Glossary for definitions of occurrence and resident births.)*

Low Birthweight Variation by Facility

In 2001, at least 10% of the births at six hospitals were low birthweight. These hospitals were: New England Medical Center (23.0%), St. Elizabeth's Medical Center (13.7%), Beth Israel Deaconess Medical Center (11.6%), Baystate Medical Center (11.5%), Boston Medical Center (10.6%), and UMass Memorial Medical Center West Campus (10.6%) (Table 24).

Publicly Funded Delivery Variation by Facility

In five hospitals, 50% or more of the deliveries were paid with public funds: Boston Medical Center (87.9%), Cambridge Hospital (64.6%), Lawrence General Hospital (61.2%), Hale Hospital (58.2%), and Mercy Medical Center (50.6%) (Table 24). In six facilities, less than 10% of deliveries were paid with public funds: The Birthplace at Wellesley (0.9%), Newton Wellesley Hospital (1.9%), Emerson Hospital (3.7%), Winchester Hospital (5.0%), North Shore Birth Center (8.1%), and South Shore Hospital (9.6%).

Prenatal Care Adequacy Variation by Facility

In 2001, the facilities with the lowest reported rate of adequacy of prenatal care among their delivery mothers (i.e.< 65%) were: Tobey Hospital (47.2%), Boston Medical Center (49.2%), Berkshire Medical Center (53.2%), North Shore Medical Center - Salem Hospital (55.6%), and Lowell General Hospital (63.5%) (Table 24). Brigham and Women's Hospital and Newton Wellesley Hospital reported the highest rate of adequacy of prenatal care among their delivery mothers, both over 95%.

Table 24. Birth Characteristics by Licensed Maternity Facility[1], Massachusetts: 2001

Facility	Location	Occurrence Births[2] (n)	Low Birthweight[3] (%)	Public Payment for Delivery[4] (%)	Adequate Prenatal Care[5] (%)
STATE TOTAL[6]		**82,238**	**7.1**	**27.1**	**85.2**
Anna Jaques Hospital	Newburyport	1,111	4.6	20.9	87.2
Baystate Medical Center	Springfield	4,526	11.5	40.7	78.5
Berkshire Medical Center	Pittsfield	778	5.5	38.0	53.2
Beth Israel Deaconess Medical Center	Boston	4,956	11.6	16.9	92.5
Beverly Hospital	Beverly	2,428	5.2	26.8	94.2
Boston Medical Center	Boston	1,932	10.6	87.9	49.2
Brigham And Women's Hospital	Boston	9,980	9.7	17.0	97.1
Brockton Hospital	Brockton	1,417	6.2	46.2	80.3
Cambridge Birth Center	Cambridge	100	--[7]	28.6	79.6
Cambridge Hospital	Cambridge	809	2.5	64.6	69.5
Cape Cod Hospital	Barnstable	1,033	3.8	34.1	90.8
Caritas Good Samaritan Medical Center	Brockton	978	6.4	39.5	69.4
Caritas Norwood Hospital	Norwood	574	3.0	14.5	91.3
Charlton Memorial Hospital	Fall River	1,703	5.9	40.5	86.1
Cooley Dickinson Hospital	Northampton	902	2.9	20.6	92.0
Emerson Hospital	Concord	1,454	3.4	3.7	81.6
Fairview Hospital	Great Barrington	166	--[7]	44.6	84.0
Falmouth Hospital	Falmouth	636	3.9	30.4	81.2
Franklin Medical Center	Greenfield	467	4.7	33.8	89.0
Hale Hospital	Haverhill	122	--[7]	58.2	70.5
Harrington Memorial Hospital	Southbridge	482	4.6	44.1	86.7
Heywood Memorial Hospital	Gardner	649	2.8	35.5	74.4
Holy Family Hospital And Medical Center	Methuen	1,477	4.2	19.3	83.0
Holyoke Hospital	Holyoke	412	4.4	48.4	77.1
Jordan Hospital	Plymouth	779	4.5	24.2	77.0
Lawrence General Hospital	Lawrence	1,488	6.2	61.2	76.9
Leominster Hospital	Leominster	1,312	3.7	34.1	83.6
Lowell General Hospital	Lowell	2,116	6.0	32.7	63.5
Martha's Vineyard Hospital	Oak Bluffs	119	--[7]	35.3	82.4

Table 24. (cont'd) Births Characteristics by Licensed Maternity Facility[1], Massachusetts: 2001

Facility	Location	Occurrence Births[2] (n)	Low Birthweight[3] (%)	Public Payment for Delivery[4] (%)	Adequate Prenatal Care[5] (%)
Mary Lane Hospital	Ware	214	5.2	43.2	83.6
Massachusetts General Hospital	Boston	3,402	8.6	30.3	79.2
Melrose-Wakefield Hospital	Melrose	1,889	3.6	15.5	90.6
Mercy Medical Center	Springfield	1,270	3.5	50.6	79.4
Metrowest Medical Center-Framingham Union Campus	Framingham	2,348	5.0	20.8	92.9
Milford-Whitinsville Regional Hospital	Milford	922	2.8	17.9	93.2
Morton Hospital	Taunton	687	4.1	34.8	83.1
Mount Auburn Hospital	Cambridge	1,431	4.6	18.0	90.2
Nantucket Cottage Hospital	Nantucket	79	--[7]	29.1	81.0
New England Medical Center Hospital	Boston	1,486	23.0	34.6	90.4
Newton Wellesley Hospital	Newton	3,216	4.1	1.9	96.2
North Adams Regional Hospital	North Adams	308	4.2	40.2	89.9
North Shore Birth Center	Beverly	74	0.0	8.1	91.9
North Shore Medical Center - Salem Hospital	Salem	1,730	4.9	30.9	55.6
Saint Vincent Hospital	Worcester	1,815	3.4	14.2	91.8
Saints Memorial Medical Ctr.	Lowell	715	4.5	29.2	80.8
South Shore Hospital	Weymouth	3,780	4.2	9.6	91.6
St. Elizabeth's Medical Center	Boston	1,583	13.7	20.8	89.5
St. Luke's Hospital	New Bedford	1,492	7.4	49.9	81.3
Sturdy Memorial Hospital	Attleboro	1,111	3.9	18.2	80.1
The Birthplace At Wellesley	Wellesley	117	0.0	0.9	77.8
Tobey Hospital	Wareham	509	3.6	34.5	47.2
UMass Memorial Medical Center - West Campus	Worcester	4,462	10.6	32.4	92.6
Winchester Hospital	Winchester	2,407	4.9	5.0	86.4
All Other Hospitals		6	--[7]	25.0	50.0
Home Births, Enroute, Other		279	9.6	32.0	61.9

NOTES: All percentages are calculated based on only those births with known values for the characteristic(s) of interest, unless otherwise stated. Hale Hospital closed to births on July 1, 2001. Name change: Mercy Hospital changed its name to Mercy Medical Center on January 16, 2001. 1. A licensed maternity facility is a medical unit licensed by the Commonwealth for the care of women during pregnancy and childbirth. 2. See Glossary for definition of occurrence births. 3. Less than 2,500 grams (5.5 lbs.) 4. Public payment for delivery includes Medicaid/Masshealth, Commonhealth, Medicare, Healthy Start, other government programs, and free care. 5. Based on the APNCU Index. 6. The percentages provided in this row are based on occurrence births and may differ from data presented elsewhere in this book which are based on resident births. 7. Calculations based on values of 1-4 for medical characteristics of facilities with less than 200 births are suppressed based Guidelines for Release of Births Data, Bureau of Health Statistics, Research and Evaluation, Massachusetts Department of Public Health.

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
STATE TOTAL	**82,238**	**81,014**	**5,795**	**5,057**	**407**	**308**
Abington	0	169	9	2	1	1
Acton	2	279	11	0	0	0
Acushnet	1	97	8	4	1	0
Adams	1	78	5	5	0	0
Agawam	0	282	19	17	0	0
Alford	1	2	0	0	0	0
Amesbury	0	221	14	9	3	2
Amherst	3	192	17	10	1	1
Andover	1	318	20	4	0	0
Aquinnah (Gay Head)	0	1	0	0	0	0
Arlington	2	580	48	5	2	0
Ashburnham	0	61	--[1]	3	0	0
Ashby	0	32	--[1]	2	0	0
Ashfield	0	12	0	0	0	0
Ashland	0	233	27	5	2	2
Athol	0	154	7	21	3	3
Attleboro	1,111	625	55	41	3	3
Auburn	0	175	13	9	0	0
Avon	0	41	--[1]	1	0	0
Ayer	1	109	10	7	0	0
Barnstable	1,041	494	31	38	2	1
Barre	0	53	--[1]	1	0	0
Becket	0	17	0	1	0	0
Bedford	0	156	16	0	0	0
Belchertown	3	178	5	5	1	1
Bellingham	1	212	13	6	2	2
Belmont	1	277	14	4	2	2
Berkley	0	64	6	4	0	0
Berlin	1	30	--[1]	2	0	0
Bernardston	0	18	--[1]	0	0	0
Beverly	2,503	468	35	14	2	2
Billerica	0	523	45	13	2	2
Blackstone	0	107	5	5	2	2
Blandford	0	9	0	0	0	0
Bolton	0	76	10	0	0	0
Boston	23,389	8,231	703	718	61	45
Bourne	1	239	16	10	2	1
Boxborough	0	58	--[1]	1	0	0
Boxford	0	73	--[1]	1	0	0
Boylston	0	36	--[1]	0	0	0
Braintree	0	402	25	10	3	3

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Brewster	0	73	6	3	2	2
Bridgewater	1	281	30	8	2	1
Brimfield	0	39	--[1]	2	0	0
Brockton	2,398	1,553	136	171	8	6
Brookfield	0	37	--[1]	2	0	0
Brookline	1	599	38	4	0	0
Buckland	1	13	--[1]	0	0	0
Burlington	0	303	23	5	2	2
Cambridge	2,345	998	67	16	4	0
Canton	0	247	16	1	0	0
Carlisle	1	46	6	0	0	0
Carver	0	139	14	5	0	0
Charlemont	0	17	--[1]	1	0	0
Charlton	0	135	10	6	0	0
Chatham	0	40	--[1]	0	0	0
Chelmsford	0	399	25	12	1	1
Chelsea	1	683	48	93	3	2
Cheshire	0	21	--[1]	0	0	0
Chester	0	11	0	0	0	0
Chesterfield	1	14	0	0	0	0
Chicopee	2	578	49	74	3	3
Chilmark	0	5	0	0	0	0
Clarksburg	0	16	--[1]	0	0	0
Clinton	0	153	8	14	1	1
Cohasset	0	116	6	1	0	0
Colrain	0	14	--[1]	4	0	0
Concord	1,454	161	7	1	0	0
Conway	0	16	--[1]	0	0	0
Cummington	0	6	--[1]	0	0	0
Dalton	1	62	--[1]	4	0	0
Danvers	0	199	14	5	1	1
Dartmouth	0	238	23	17	1	1
Dedham	1	289	15	5	1	1
Deerfield	1	48	--[1]	1	0	0
Dennis	1	134	7	5	0	0
Dighton	0	63	0	1	0	0
Douglas	0	134	9	4	2	1
Dover	0	60	--[1]	0	1	1
Dracut	0	379	31	12	1	0
Dudley	0	119	7	6	0	0
Dunstable	0	36	--[1]	0	0	0
Duxbury	1	161	7	0	2	2
East Bridgewater	0	164	12	4	1	1
East Brookfield	0	33	0	1	0	0
East Longmeadow	0	132	10	1	0	0

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Eastham	0	41	--[1]	1	0	0
Easthampton	0	166	11	11	0	0
Easton	0	257	19	3	3	3
Edgartown	0	30	0	0	0	0
Egremont	0	8	--[1]	1	0	0
Erving	0	20	--[1]	1	0	0
Essex	0	34	--[1]	0	2	2
Everett	2	588	39	28	3	3
Fairhaven	0	138	6	9	1	1
Fall River	1,709	1,227	100	158	9	9
Falmouth	637	302	17	16	3	2
Fitchburg	0	615	50	91	3	2
Florida	0	9	0	0	0	0
Foxborough	0	209	10	4	0	0
Framingham	2,352	1,013	81	46	9	9
Franklin	2	449	20	5	3	3
Freetown	1	66	5	3	0	0
Gardner	649	255	12	31	1	1
Georgetown	0	113	5	0	1	0
Gill	0	15	--[1]	1	0	0
Gloucester	1	318	25	17	2	2
Goshen	0	9	0	0	0	0
Gosnold	0	0	0	0	0	0
Grafton	3	234	9	5	0	0
Granby	0	69	--[1]	3	1	1
Granville	0	13	0	0	0	0
Great Barrington	170	66	--[1]	5	0	0
Greenfield	470	195	16	17	2	2
Groton	0	139	6	1	0	0
Groveland	0	74	--[1]	1	0	0
Hadley	1	43	5	2	0	0
Halifax	0	105	--[1]	4	0	0
Hamilton	0	103	10	1	0	0
Hampden	0	53	5	0	0	0
Hancock	0	6	0	0	0	0
Hanover	0	169	14	1	1	1
Hanson	0	140	12	7	0	0
Hardwick	0	29	--[1]	4	0	0
Harvard	0	41	--[1]	0	0	0
Harwich	0	90	--[1]	4	0	0
Hatfield	0	25	0	1	0	0
Haverhill	125	905	54	63	2	2
Hawley	0	0	0	0	0	0
Heath	0	10	--[1]	1	0	0
Hingham	0	251	16	1	2	1

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Hinsdale	1	20	--[1]	1	0	0
Holbrook	0	118	13	4	0	0
Holden	0	184	11	3	0	0
Holland	0	25	--[1]	3	0	0
Holliston	0	161	18	4	4	4
Holyoke	417	595	57	135	9	6
Hopedale	0	83	8	2	1	1
Hopkinton	2	233	5	0	0	0
Hubbardston	1	51	--[1]	3	0	0
Hudson	0	240	14	9	1	1
Hull	0	124	8	5	0	0
Huntington	1	23	--[1]	0	0	0
Ipswich	0	126	8	2	2	1
Kingston	0	186	16	1	1	1
Lakeville	0	123	8	4	3	2
Lancaster	1	75	--[1]	2	0	0
Lanesborough	0	26	--[1]	1	0	0
Lawrence	1,489	1,506	124	278	17	12
Lee	0	60	--[1]	3	0	0
Leicester	0	121	8	8	2	2
Lenox	0	28	--[1]	1	0	0
Leominster	1,319	564	34	38	2	0
Leverett	2	19	--[1]	1	0	0
Lexington	3	237	17	2	0	0
Leyden	0	13	0	0	0	0
Lincoln	0	102	--[1]	3	0	0
Littleton	0	117	12	3	0	0
Longmeadow	0	121	5	1	0	0
Lowell	2,833	1,739	150	218	9	8
Ludlow	1	181	11	14	0	0
Lunenburg	1	98	5	3	1	1
Lynn	3	1,435	100	160	8	6
Lynnfield	0	129	8	2	0	0
Malden	1	793	51	28	4	0
Manchester-by-the-Sea	1	34	0	0	0	0
Mansfield	0	363	20	9	1	0
Marblehead	1	272	13	1	0	0
Marion	0	55	--[1]	0	0	0
Marlborough	1	599	42	15	3	2
Marshfield	0	365	21	5	0	0
Mashpee	0	151	12	9	0	0
Mattapoisett	0	54	5	0	0	0
Maynard	0	153	11	2	0	0
Medfield	0	155	22	0	0	0
Medford	2	626	40	7	2	2

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Medway	0	174	13	2	0	0
Melrose	1,891	370	31	6	0	0
Mendon	1	93	--[1]	1	0	0
Merrimac	0	82	--[1]	3	0	0
Methuen	1,477	550	37	50	0	0
Middleborough	0	267	14	17	3	3
Middlefield	0	2	0	0	0	0
Middleton	0	80	--[1]	0	0	0
Milford	923	388	25	19	3	2
Millbury	0	132	8	7	2	2
Millis	0	123	6	2	0	0
Millville	0	34	0	6	1	0
Milton	0	340	17	7	0	0
Monroe	0	2	0	0	0	0
Monson	0	91	5	5	1	1
Montague	1	87	--[1]	9	0	0
Monterey	2	5	--[1]	0	0	0
Montgomery	0	9	0	0	0	0
Mount Washington	0	0	0	0	0	0
Nahant	0	36	--[1]	0	0	0
Nantucket	81	135	7	3	3	3
Natick	3	457	26	0	5	4
Needham	2	407	28	2	0	0
New Ashford	0	2	0	0	0	0
New Bedford	1,499	1,294	121	188	10	5
New Braintree	0	8	0	2	0	0
New Marlborough	0	14	--[1]	0	0	0
New Salem	0	5	0	0	0	0
Newbury	0	104	--[1]	1	0	0
Newburyport	1,112	215	10	14	0	0
Newton	3,220	834	44	7	3	1
Norfolk	0	119	--[1]	1	0	0
North Adams	308	155	14	27	0	0
North Andover	0	361	18	3	1	1
North Attleboro	1	353	25	10	0	0
North Brookfield	0	51	--[1]	6	0	0
North Reading	1	196	11	1	0	0
Northampton	905	203	12	10	0	0
Northborough	0	158	9	2	0	0
Northbridge	1	211	16	18	0	0
Northfield	1	23	0	0	0	0
Norton	0	256	22	10	0	0
Norwell	0	122	8	1	0	0
Norwood	577	392	26	8	0	0
Oak Bluffs	119	32	--[1]	2	0	0

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Oakham	0	20	--[1]	1	0	0
Orange	0	85	7	11	0	0
Orleans	0	21	--[1]	1	0	0
Otis	0	18	--[1]	0	0	0
Oxford	1	167	10	12	0	0
Palmer	0	146	15	16	0	0
Paxton	0	49	--[1]	0	0	0
Peabody	2	576	52	22	4	4
Pelham	0	5	0	0	0	0
Pembroke	0	249	8	8	0	0
Pepperell	1	144	--[1]	3	1	0
Peru	0	7	0	1	0	0
Petersham	0	7	0	0	0	0
Phillipston	0	17	0	0	0	0
Pittsfield	783	488	43	50	5	3
Plainfield	0	4	0	1	0	0
Plainville	0	105	6	4	0	0
Plymouth	781	680	35	20	3	1
Plympton	0	28	0	2	0	0
Princeton	1	36	--[1]	2	0	0
Provincetown	0	12	--[1]	0	0	0
Quincy	2	1,137	69	31	4	4
Randolph	0	407	40	23	2	0
Raynham	1	161	11	4	2	2
Reading	0	305	18	1	2	2
Rehoboth	0	89	9	3	1	1
Revere	1	670	55	50	6	5
Richmond	0	6	0	0	0	0
Rochester	0	43	--[1]	1	1	1
Rockland	0	246	19	12	1	1
Rockport	0	54	0	3	0	0
Rowe	0	2	0	0	0	0
Rowley	0	82	--[1]	2	0	0
Royalston	0	16	--[1]	2	0	0
Russell	2	16	--[1]	1	0	0
Rutland	0	97	5	4	0	0
Salem	1,733	532	39	48	1	1
Salisbury	1	94	6	6	0	0
Sandisfield	0	7	0	2	0	0
Sandwich	0	220	10	6	1	0
Saugus	0	283	16	8	0	0
Savoy	0	12	0	0	0	0
Scituate	0	196	8	1	0	0
Seekonk	0	120	9	3	0	0
Sharon	0	164	13	3	0	0

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Sheffield	0	32	0	2	0	0
Shelburne	1	19	--[1]	1	0	0
Sherborn	0	45	--[1]	0	1	1
Shirley	1	77	6	0	0	0
Shrewsbury	1	470	38	7	1	1
Shutesbury	0	12	--[1]	0	0	0
Somerset	0	144	8	12	2	2
Somerville	7	872	60	42	3	2
South Hadley	1	159	8	8	1	1
Southampton	0	48	5	1	0	0
Southborough	0	144	11	2	1	1
Southbridge	482	283	22	45	1	0
Southwick	0	84	--[1]	3	0	0
Spencer	1	127	5	10	1	1
Springfield	5,808	2,407	227	445	15	8
Sterling	0	99	7	1	3	3
Stockbridge	0	10	0	1	0	0
Stoneham	0	260	22	2	1	1
Stoughton	0	338	29	11	0	0
Stow	0	78	--[1]	0	0	0
Sturbridge	1	74	--[1]	1	1	1
Sudbury	3	247	9	0	0	0
Sunderland	0	39	0	0	0	0
Sutton	0	126	7	2	0	0
Swampscott	0	140	8	1	0	0
Swansea	1	142	8	8	1	0
Taunton	688	803	66	63	9	7
Templeton	0	78	--[1]	3	0	0
Tewksbury	2	365	20	5	0	0
Tisbury	0	41	--[1]	2	0	0
Tolland	0	6	--[1]	0	0	0
Topsfield	0	56	--[1]	0	0	0
Townsend	0	120	6	6	1	1
Truro	0	11	--[1]	0	0	0
Tyngsborough	0	165	14	2	1	1
Tyringham	0	3	--[1]	0	0	0
Upton	0	114	6	0	0	0
Uxbridge	0	189	19	9	3	3
Wakefield	0	312	23	6	0	0
Wales	0	13	0	1	1	1
Walpole	0	279	18	1	0	0
Waltham	1	686	68	24	2	1
Ware	214	103	5	10	1	0
Wareham	509	256	15	20	2	0
Warren	0	53	--[1]	6	1	0

Table 25A. Birth Characteristics: Occurrence and Resident Births and Infant Deaths, Massachusetts Municipalities: 2001

Community	Occurrence Births[2]	Resident Births[3]	Low Birthweight[4]	Teen Births, < 20 years	Infant Deaths[5]	Neonatal Deaths[6]
Warwick	0	8	0	1	0	0
Washington	0	3	0	0	0	0
Watertown	1	340	17	4	4	4
Wayland	0	136	11	0	1	1
Webster	0	214	14	19	1	1
Wellesley	117	316	14	1	0	0
Wellfleet	0	16	0	0	0	0
Wendell	0	5	0	0	0	0
Wenham	0	43	--[1]	0	0	0
West Boylston	0	70	--[1]	0	0	0
West Bridgewater	0	88	--[1]	1	0	0
West Brookfield	0	42	--[1]	4	0	0
West Newbury	1	42	--[1]	0	0	0
West Springfield	0	319	23	29	2	2
West Stockbridge	0	13	0	0	0	0
West Tisbury	0	29	0	2	0	0
Westborough	0	242	17	3	2	2
Westfield	0	452	23	39	1	0
Westford	0	314	14	1	1	1
Westhampton	0	14	--[1]	0	0	0
Westminster	0	81	--[1]	3	0	0
Weston	1	125	9	0	0	0
Westport	0	126	7	13	1	1
Westwood	1	181	5	3	0	0
Weymouth	3,782	700	51	22	1	1
Whately	0	17	--[1]	1	0	0
Whitman	0	195	12	7	0	0
Wilbraham	1	121	6	2	0	0
Williamsburg	1	19	0	0	0	0
Williamstown	0	41	--[1]	1	0	0
Wilmington	0	273	13	4	0	0
Winchendon	0	142	13	14	1	0
Winchester	2,410	283	17	0	0	0
Windsor	0	9	0	0	0	0
Winthrop	0	181	10	2	0	0
Woburn	0	507	34	9	1	1
Worcester	6,293	2,572	221	272	21	17
Worthington	0	14	0	0	0	0
Wrentham	0	121	8	1	1	1
Yarmouth	0	205	16	14	1	1
Unknown	0	0	0	0	0	0

1. Values of 1-4 for medical characteristics of communities with less than 200 births are suppressed based on Guidelines for Release of Birth Data, Bureau of Health Statistics, Research and Evaluation, Massachusetts Department of Public Health. 2. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details. 3. Births to mothers who report their usual place of residence as a particular geographical place (state, or city/town). See Glossary for more details. 4. Less than 2,500 grams (5.5 lbs.). 5. Death of a child whose age is less than one year. 6. Death of a child whose age is less than 28 days.

Table 25B. Birth Characteristics, Occurrence and Resident Births and Infant Deaths by County, Massachusetts: 2001

County Name	Occurrence Births[1]	Resident Births[2]			Deaths	
		Number	Low Birthweight[3]	Teen (< 20 years)	Infant[4]	Neonatal[5]
STATE TOTAL	**82,238**	**81,014**	**5,795**	**5,057**	**407**	**308**
Barnstable	1,680	2,049	129	107	11	7
Berkshire	1,267	1,244	94	106	5	3
Bristol	5,012	6,626	528	563	45	35
Dukes	119	138	4	6	0	0
Essex	8,450	9,658	645	719	46	36
Franklin	477	714	50	50	2	2
Hampden	6,231	5,703	463	788	32	21
Hampshire	1,130	1,296	78	62	5	4
Middlesex	16,544	18,820	1,307	572	78	59
Nantucket	81	135	7	3	3	3
Norfolk	4,486	8,200	529	163	18	16
Plymouth	3,690	6,409	438	308	31	22
Suffolk	23,391	9,765	816	863	70	52
Worcester	9,680	10,257	707	747	61	48

1. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details.
2. Births to mothers who report their usual place of residence as a particular geographical place (state, or city/town). See Glossary for more details. 3. Less than 2,500 grams (5.5 lbs.). 4. Death of a child whose age is less than one year. 5. Death of a child whose age is less than 28 days.

Table 25C. Birth Characteristics, Occurrence and Resident Births and Infant Deaths, Massachusetts Community Health Network Areas (CHNAs): 2001

Community Health Network Area	Occurrence Births[1]	Resident Births[2]			Deaths	
		Number	Low Birthweight[3]	Teen (< 20 years)	Infant[4]	Neonatal[5]
STATE TOTAL	**82,238**	**81,014**	**5,795**	**5,057**	**407**	**308**
Community Health Network of Berkshire County	1,267	1,244	94	106	5	3
Upper Valley Health Web (Franklin County)	477	908	59	73	5	5
Partnership for Health in Hampshire County (Northampton)	1,129	1,273	75	62	5	4
The Community Health Connection (Springfield)	5,811	3,809	320	520	18	11
Community Health Network of Southern Worcester County	485	1,412	82	124	6	4
Community Partners for Health (Milford)	928	2,314	143	79	17	14
Community Health Network of Greater Metro West (Framingham)	2,361	5,250	360	101	30	28
Community Wellness Coalition (Worcester)	6,297	4,043	314	311	26	22
Fitchburg/Gardner Community Health Network	1,976	3,283	203	241	14	9
Greater Lowell Community Health Network	2,835	3,920	300	263	15	13
Greater Lawrence Community Health Network	2,967	2,815	201	335	18	13
Greater Haverhill Community Health Network	1,239	2,005	107	100	6	4
Community Health Network North (Beverly/Gloucester)	2,505	1,236	86	37	8	7
North Shore Community Health Network	1,739	3,602	251	247	14	12
Greater Woburn/Concord/Littleton Community Health Network	3,870	2,522	163	28	3	3
North Suburban Health Alliance (Medford/Malden/Melrose)	1,897	3,450	235	79	12	8
Greater Cambridge/Somerville Community Health Network	2,356	3,067	206	71	15	8
West Suburban Health Network (Newton/Waltham)	3,343	2,898	187	42	7	4
Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	23,392	10,364	854	867	70	52
Blue Hills Community Health Alliance (Greater Quincy)	4,361	4,598	303	114	12	9
Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	421	1,840	143	262	13	9
Greater Brockton Community Health Network	2,399	3,204	265	212	15	12
South Shore Community Partners in Prevention (Plymouth)	782	2,468	149	65	8	6
Greater Attleboro-Taunton Health & Education Response	1,801	3,287	245	169	22	18
Partners for a Healthier Community (Fall River)	1,710	1,639	123	191	13	12
Greater New Bedford Health & Human Services Coalition	2,010	2,241	187	242	16	8
Cape and Islands Community Health Network	1,880	2,322	140	116	14	10

1. Births occurring in a geographical place (state, city/town) regardless of the residency of the mother. See Glossary for more details. 2. Births to mothers who report their usual place of residence as a particular geographical place (state, city/town). See Glossary for more details. 3. Less than 2,500 grams (5.5 lbs.). 4. Death of a child whose age is less than one year. 5. Death of a child whose age is less than 28 days.

APPENDIX

TECHNICAL NOTES

1. DATA AVAILABILITY:

This publication and other Department of Public Health publications and materials can be accessed on the Internet at:

http://www.state.ma.us/dph/pubstats.htm

Detailed information on 2001 births in Massachusetts, as well as access to other Department of Public Health data, is available on the Department's free, Internet-accessible data warehouse, **MassCHIP**. To register as a user, visit the MassCHIP website at http://masschip.state.ma.us, or call 1-888-MASCHIP (within MA only) or (617) 624-5541.

2. DATA CAUTIONS:

Limitations of small numbers:
Cells in some tables in this publication, and particularly those tables specific to the individual cities and towns, contain small numbers. Rates and proportions based upon less than five observations are suppressed, and trends based upon small numbers should be interpreted cautiously.

Differences with previously published data
Numbers and rates in this publication may differ from those contained in previous reports because of updates of birth and death certificate files, or release of the most up-to-date population estimates for a given year (see Technical Note #4 for details on population files).

Self-reported data
Many items used in this publication, such as maternal smoking, education, and race/ethnicity are self-reported, and are subject to the usual limitations of this type of information.

3. CHANGES IN THE COLLECTION OF RACE AND ETHNICITY INFORMATION:

Assignment of an Infant's Race/Ethnicity
Prior to 1989, the race/ethnicity of an infant was assigned by combining information on the race/ethnicity of the mother and the race/ethnicity of the father. Since 1989, Massachusetts has followed the recommendation of the National Center for Health Statistics of classifying births according to the self-reported race/ethnicity of the mother. Therefore, beginning in 1989, the race/ethnicity of an infant is identical to the self-reported race/ethnicity of the infant's mother.

Addition of Information on Hispanic Ethnicity
Beginning in 1986, an identifier for Hispanic ethnicity was added to the birth certificate; in 1989, an identifier for Hispanic ethnicity was added to the death certificate. Prior to these changes, most Hispanics were included with whites and it was not possible to accurately calculate Hispanic-specific rates of natality and mortality.

4. POPULATION ESTIMATES:

The source of the 2000 population estimates for Massachusetts is the Massachusetts Department of Public Health (DPH) Race-Allocated Census 2000 Estimates (MRACE) file. This file is based upon the U.S. Census 2000 SF1 file (released June, 2001) for Massachusetts, which contains data on population and housing for the 351 towns, 14 counties, and the state overall.

The MRACE file was derived from the Census 2000 file by allocating persons who indicated “some other race” or multiple races to the conventional DPH race categories: “White”, “Black or African American”, “Asian,” “Native American,” and "Hispanic." In Census 2000, unlike previous censuses, respondents were able to classify themselves by Hispanic ethnicity and by single or multi-race categories, including “some other race.” In order to make the DPH population 2000 file consistent with previous years’ population files, the MRACE file maintains the prior mutually exclusive race and Hispanic categories.

Population-based rates between 1991 and 1999 in this publication were calculated as follows:

- 1991-1998: Massachusetts Institute for Social and Economic Research (MISER) Population Estimates;
- 1999: Massachusetts Dept. of Public Health 1999 Population Estimate, which is a linear interpolation between the preliminary DPH Population 2000 file and the MISER 1998 Population Estimate.

5. DEFINITION AND IDENTIFICATION OF PREGNANCY-ASSOCIATED AND MATERNAL DEATHS.

There are various ways to categorize a woman who dies during pregnancy, childbirth, or in the postpartum period. Two components are included in every definition of maternal death: the timing of death in relation to the pregnancy and birth, and the causes of death. Two definitions are used in this report: maternal death and pregnancy-associated death. The traditional definition of maternal death can be found in the World Health Organization’s *International Classification of Diseases* (ICD). WHO defines maternal deaths as women who died during pregnancy or within 42 days of delivery from causes related to pregnancy, childbirth or its management. Deaths from accidental or incidental causes are excluded. The National Center for Health Statistics uses the WHO definition to conduct surveillance on maternal death in the US.

Maternal deaths are restricted to women whose underlying causes of death were coded with ICD-9 codes 630-676 (from 1990-1998), or with ICD-10 codes O00-O99 (1999 forward).

The definition of a pregnancy-associated death was developed in 1986 by the Maternal Mortality Study Group, which is jointly chaired by American College of Obstetrics and Gynecology (ACOG) and the Centers for Disease Control and Prevention (CDC). Pregnancy-associated deaths differ from maternal deaths in two fundamental ways: all deaths are included irrespective of cause, and deaths that occurred between 42 and 364 days after delivery also are included.

6. CHANGE IN MEASUREMENT OF ADEQUACY OF PRENATAL CARE

Beginning with this year’s publication (*Massachusetts Births 2001*), adequacy of prenatal care is being measured using a new method. The Adequacy of Prenatal Care Utilization (APNCU) Index, developed by Dr. Milton Kotelchuck, has replaced the Kessner Index, which has been used to date in the *Advanced Data Births* and *Massachusetts Births* series. The APNCU Index is the standard used in Healthy People 2010 and by the majority of states. It improves upon the Kessner Index in various ways, the most important being the ability to distinguish between inadequate prenatal care due to the timing of initiation and inadequate care due to insufficient prenatal care visits. The APNCU Index also improves upon the Kessner Index by correcting some of its principle faults. First, the APNCU Index more accurately assesses adequacy of visits for term pregnancies; the Kessner Index characterizes 9 or more visits as adequate, due to an early computer database limitation, which only allowed for a single-digit number to record prenatal care visits. Other faults of the Kessner Index include its bias towards measurement of adequacy of initiation of care, and its various computational algorithms due to inadequate initial documentation.

Table 1 of this report provides a comparison of data on adequacy of prenatal care from 1996-2001 as measured by these two separate indices. Below are the definitions for the APNCU Index categories and its two component indices (initiation and received services), and the definition of the Kessner Index categories. Also below is a short summary of the major differences in classification of adequacy of prenatal care using the Kessner Index and the APNCU Index.

Adequacy of Prenatal Care Utilization (APNCU) Index: Definition of Categories

Category	Month Prenatal Care Began	% of Expected[1] Prenatal Care Visits
Adequate Intensive	1, 2, 3, or 4	110% or more
Adequate Basic	1, 2, 3, or 4	80 – 109%
Intermediate	1, 2, 3, or 4	50 – 79%
Inadequate	Month 5 or later	Less than 50%
Unknown	Prenatal care information not recorded	

Component Indices of the APNCU Index: Definitions of Categories

Adequacy of Initiation Index

Category	Month Prenatal Care Began
Adequate Intensive	1 or 2
Adequate Basic	3 or 4
Intermediate	5 or 6
Inadequate	Month 7 or later, or no PNC
Unknown	Prenatal care initiation information not recorded

Adequacy of Received Services (Visits) Index

Category	% of Expected[1] Prenatal Care Visits
Adequate Intensive	110% or more
Adequate Basic	80 – 109%
Intermediate	50 – 79%
Inadequate	Less than 50%
Unknown	Information on prenatal care visits not recorded

Kessner Index of Adequacy of Prenatal Care: Definition of Categories

Category	Trimester Care Began	Number of Visits
Adequate	1	9 or more
Intermediate	1	5-8
	2	5 or more
Inadequate	1	1-4
	2	1-4
	3	1 or more
No prenatal care	--	0
Unknown	Unknown	Unknown

Summary of Major Differences in Categorization of Adequacy of Prenatal Care between the Kessner Index and the APNCU Index

The two different methods used in the Kessner Index and APNCU Index to calculate adequacy of prenatal care can result in differences in how each one classifies adequacy of prenatal care. These differences only occur under certain conditions, not in all cases (see "Explanation" column).

The Kessner Index classifies prenatal care as…	… but the APNCU Index classifies prenatal care as …	Explanation
Intermediate	Adequate Basic	This is primarily due to the fact that the APNCU Index allows for prenatal care in the 4th month of pregnancy to be considered adequate if the mother received 80-109% of expected visits, whereas the Kessner Index only allows for care begun in the first trimester (months 1-3) to be considered adequate.
Intermediate	Inadequate	This is primarily due to the fact that the APNCU categorizes any prenatal care beginning after month 4 as “inadequate” whereas the Kessner Index allows for care beginning in months 5 or 6 with 5 or more visits to be “intermediate.”
Adequate	Intermediate	This is primarily due to the consideration of “expected” visits (based on when the mother initiated care and the length of gestation) using the APNCU Index, which bases expected visits on the ACOG recommendations,[1] which can be as high as 14 visits if a gestational period is 40 weeks, whereas the Kessner Index considers 9 visits sufficient in all cases.
Adequate	Adequate Intensive	The APNCU Index added an "Adequate Intensive" category, which is not used in the Kessner Index. This allows analysis of situations in which more than normal care is received (e.g. women with high risk conditions, pregnancy complications).

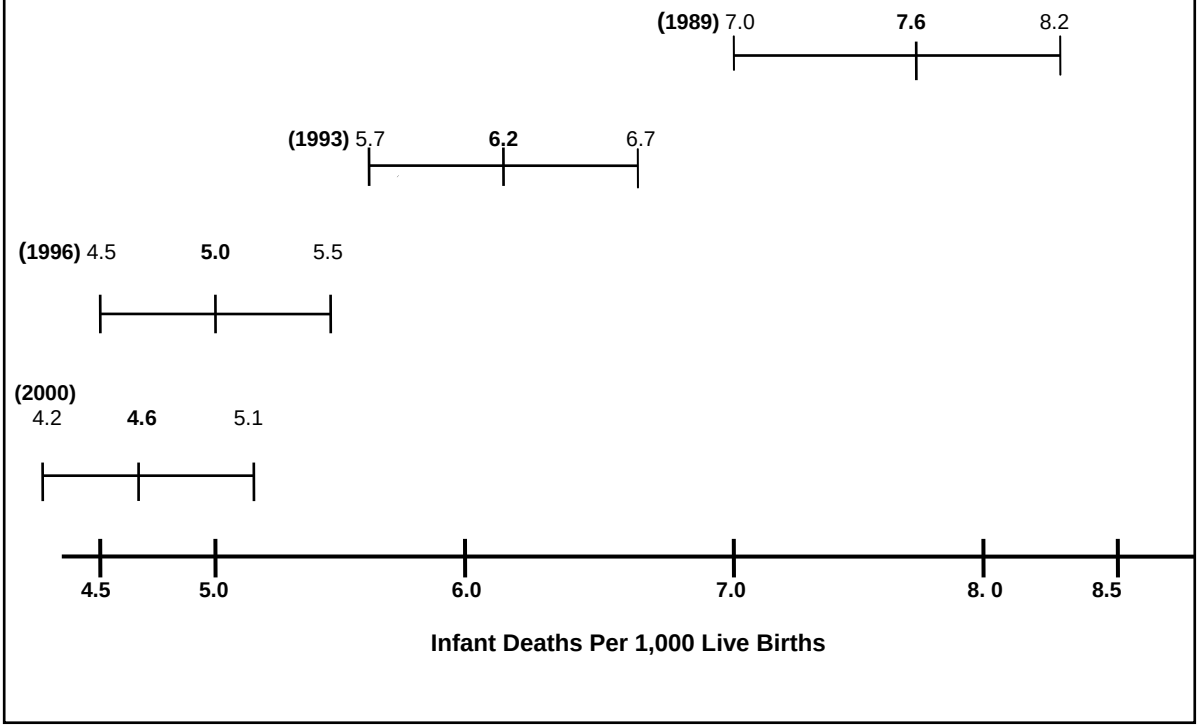
1. The number of “expected” visits are determined based on standards set by the American College of Obstetricians and Gynecologists (ACOG).

CONFIDENCE INTERVALS AND INFANT MORTALITY RATES

Beginning in the 1992 Advance Data: Births publication, 95% confidence intervals were added to the calculation of infant mortality rates (IMRs). The confidence interval (CI) provides a measure of stability of the IMR and a basis for comparing rates to determine if they are statistically different. Rates can be compared for the same group in different years, or for different groups in the same year. The width of the CI reflects the stability of the IMR. For example, a narrow CI reflects high stability, and a wide interval reflects low stability. If the CIs around two IMRs being compared do not overlap, the difference between the two rates is statistically significant. The following table and chart illustrate the concept of statistically significant differences using actual data from 1989, 1993, 1996, and 2000.

Comparison of Infant Mortality Rates and Confidence Intervals for Selected Years

Year	IMR (per 1,000 births)	95% Confidence Interval
1989	7.6	(7.0-8.2)
1993	6.2	(5.7-6.7)
1996	5.0	(4.5-5.5)
2000	4.6	(4.2-5.1)



The difference between the 1993 IMR and 1996 IMR is statistically significant -- the confidence intervals do not overlap. The same is true for the differences between the 1989 IMR and each annual IMR for 1993, 1996, and 2000. However, the difference between the 1996 and 2000 IMRs is not statistically significant, since their confidence intervals overlap.

95% Confidence Intervals for Infant Mortality Rates, by Race and Hispanic Ethnicity, Massachusetts: 1990-2001

	Total[1]		Non-Hispanic White		Non-Hispanic Black		Hispanic		Asian	
Year	n	**Rate**[2] (C.I).	n	**Rate**[2] (C.I).	n	**Rate**[2] (C.I).	n	**Rate**[2] (C.I).	n	**Rate**[2] (C.I).
1990	649	**7.0** (6.5, 7.5)	442	**6.1** (5.5, 6.7)	98	**13.7** (11.0, 16.4)	77	**9.1** (7.1, 11.1)	24	**7.0** (4.2, 10.0)
1991	577	**6.5** (6.0, 7.0)	381	**5.5** (4.9, 6.1)	101	**15.0** (12.1, 17.9)	80	**9.4** (7.3, 11.5)	14	**4.2** (2.0, 6.4)
1992	569	**6.5** (6.0, 7.0)	371	**5.5** (4.9, 6.1)	110	**16.4** (13.4, 19.4)	67	**7.9** (6.0, 9.8)	16	**4.9** (2.5, 7.3)
1993	523	**6.2** (5.7, 6.7)	346	**5.3** (4.7, 5.9)	84	**13.1** (10.3, 15.9)	77	**9.3** (7.2, 11.4)	13	**3.9** (1.8, 6.0)
1994	499	**6.0** (5.4, 6.5)	343	**5.3** (4.7, 5.9)	79	**12.6** (9.8, 15.4)	64	**7.6** (5.7, 9.4)	8	**2.4** (0.7, 4.0)
1995	419	**5.1** (4.6, 5.6)	275	**4.4** (3.8, 4.9)	65	**11.1** (8.4, 13.8)	58	**7.2** (5.3, 9.0)	19	**5.5** (3.0, 8.0)
1996	403	**5.0** (4.5, 5.5)	289	**4.7** (4.1, 5.2)	63	**11.4** (8.6, 14.2)	40	**5.1** (3.5, 6.7)	8	**2.2** (0.7, 3.7)
1997	425	**5.3** (4.8, 5.8)	294	**4.8** (4.2, 5.3)	64	**11.7** (8.8, 14.5)	55	**6.7** (4.9, 8.4)	10	**2.6** (1.0, 4.2)
1998	414	**5.1** (4.6, 5.6)	294	**4.6** (4.1, 5.2)	64	**10.6** (7.9, 13.3)	55	**6.7** (5.0, 8.4)	10	**2.7** (1.0, 4.3)
1999	418	**5.2** (4.7, 5.7)	285	**4.7** (4.2, 5.3)	72	**12.3** (9.5, 15.1)	49	**5.5** (4.0, 7.1)	8	**1.9** (0.6, 3.3)
2000	377	**4.6** (4.2, 5.1)	232	**3.8** (3.4, 4.3)	74	**12.8** (9.9, 15.7)	48	**5.2** (3.7, 6.6)	19	**4.1** (2.2, 5.9)
2001	407	**5.0** (4.5, 5.5)	245	**4.1** (3.6, 4.7)	71	**12.1** (9.3, 14.9)	69	**7.3** (5.6, 9.1)	15	**3.1** (1.6, 4.7)

[1]Deaths of infants of unknown race are excluded except for the total calculation. For rate computations, births of infants of unknown race are allocated into the race categories according to the distribution of births of known race.
[2]Rates are expressed per 1,000 live births.

In 2001, the non-Hispanic black infant mortality rate was 12.1 deaths per 1,000 live births (95% CI: 9.3,14.9), which was three times greater than the non-Hispanic white infant mortality rate of 4.1 (95% CI: 3.6, 4.7). The difference in these two rates was statistically significant. The rate of infant mortality for non-Hispanic blacks was also significantly elevated compared to both Hispanics (95% CI: 5.6, 9.1) and Asians (95% CI: 1.6, 4.7) in 2001.

DEFINITION OF RATES

Age-Specific Birth Rate

The number of children born to women in a specific age group divided by the population of women in that specific age group, multiplied by 1,000.

$$\text{Age-Specific Birth Rate} = \frac{\text{Number of births to females ages X to Y years}}{\text{Number of females ages X to Y years in the population}} \times 1{,}000$$

Birth Rate

(See Age-Specific Birth Rate, Crude Birth Rate, Fertility Rate, and Teen Birth Rate)

Cesarean Section Rates

$$\text{Total C-section rate} = \frac{\text{Number of C-section births}}{\text{Number of occurrence births}} \times 100$$

$$\text{Primary C-section rate} = \frac{\text{Number of primary C-section births}}{\text{[Number of occurrence births-(number of repeat C-section births+VBACs)]}} \times 100$$

$$\text{Repeat C-section rate} = \frac{\text{Number of repeat C-section births}}{\text{(Number of repeat C-section births+number of VBACs)}} \times 100$$

$$\text{VBAC rate} = \frac{\text{Number of VBACs}}{\text{(Number of repeat C-section births+number of VBACs)}} \times 100$$

Crude Birth Rate

$$\text{Crude Birth rate} = \frac{\text{Number of resident live births}}{\text{Total resident population}} \times 1{,}000$$

Fertility Rate (sometimes referred to as "Birth Rate")

$$\text{Fertility rate} = \frac{\text{Number of births to females ages 15-44 years}}{\text{Number of females ages 15-44 years in the population}} \times 1{,}000$$

Fetal Mortality Rate

$$\text{Fetal Mortality Rate} = \frac{\text{Number of fetal deaths}}{\text{Number of fetal deaths plus live births in the same year}} \times 1{,}000$$

Infant Mortality Rate (IMR)
The death rate among infants less than one year old, per 1,000 live births.

$$\text{Infant Mortality Rate} = \frac{\text{Number of resident deaths of infants less than one year old in a year}}{\text{Number of resident live births in the same year}} \times 1{,}000$$

Maternal Mortality Ratio (MMR)
The number of maternal deaths per 100,000 live occurrence births. The term "ratio" is used instead of "rate" in this report because the numerator includes some maternal deaths that were not related to live-born infants and thus were not included in the denominator.

$$\text{Maternal Mortality Ratio (MMR)} = \frac{\text{Number of maternal deaths}}{\text{Number of occurrence live births in the same year}} \times 100{,}000$$

Neonatal Mortality Rate (NMR)
The death rate among infants less than 28 days of age, per 1,000 live births.

$$\text{Neonatal Mortality Rate} = \frac{\text{Number of resident deaths of infants less than 28 days of age in a year}}{\text{Number of resident live births in the same year}} \times 1{,}000$$

Perinatal Mortality Rate

$$\text{Perinatal Mortality Rate} = \frac{\text{Number of fetal and infant deaths in the perinatal period (from 28 weeks gestational age through 6 days old)}}{\text{Number of fetal deaths plus live births in the same year}} \times 1{,}000$$

Post Neonatal Mortality Rate

The death rate among infants 28 days of age to less than one year old, per 1,000 live births.

$$\text{Post Neonatal Mortality Rate} = \frac{\text{Number of resident deaths of infants 28 days of age to less than one year of age in a year}}{\text{Number of resident live births in the same year}} \times 1{,}000$$

Pregnancy-Associated Mortality Ratio (PAMR)

The number of pregnancy-associated deaths per 100,000 live occurrence births. The term "ratio" is used instead of rate in this report because the numerator includes some maternal deaths that were not related to live-born infants and thus were not included in the denominator.

$$\text{Pregnancy-Associated Mortality Ratio (PAMR)} = \frac{\text{Number of pregnancy-associated deaths}}{\text{Number of occurrence live births in the same year}} \times 100{,}000$$

Teen Birth Rate

$$\text{Teen birth rate} = \frac{\text{Number of births to females ages 15-19 years old}}{\text{Number of females ages 15-19 years old in the population}} \times 1{,}000$$

Total Rate of Change

Total rate of change between two numbers or rates is expressed as a percentage in this report (e.g. The Massachusetts birth rate decreased by 12% from 1990 to 1996.):

$$\frac{Pn-Po}{Po} \times 100$$

where

Pn = rate during later time period
Po = rate during earlier time period

Population Estimates for Massachusetts Communities, 2000

TOWN NAME	COUNTY	CHNA	POPULATION
Abington	Plymouth	22	14,605
Acton	Middlesex	15	20,331
Acushnet	Bristol	26	10,161
Adams	Berkshire	1	8,809
Agawam	Hampden	4	28,144
Alford	Berkshire	1	399
Amesbury	Essex	12	16,450
Amherst	Hampshire	3	34,874
Andover	Essex	11	31,247
Aquinnah (Gay Head)	Dukes	27	344
Arlington	Middlesex	17	42,389
Ashburnham	Worcester	9	5,546
Ashby	Middlesex	9	2,845
Ashfield	Franklin	2	1,800
Ashland	Middlesex	7	14,674
Athol	Worcester	2	11,299
Attleboro	Bristol	24	42,068
Auburn	Worcester	8	15,901
Avon	Norfolk	22	4,443
Ayer	Middlesex	9	7,287
Barnstable	Barnstable	27	47,821
Barre	Worcester	9	5,113
Becket	Berkshire	1	1,755
Bedford	Middlesex	15	12,595
Belchertown	Hampshire	3	12,968
Bellingham	Norfolk	6	15,314
Belmont	Middlesex	17	24,194
Berkley	Bristol	24	5,749
Berlin	Worcester	9	2,380
Bernardston	Franklin	2	2,155
Beverly	Essex	13	39,862
Billerica	Middlesex	10	38,981
Blackstone	Worcester	6	8,804
Blandford	Hampden	4	1,214
Bolton	Worcester	9	4,148
Boston	Suffolk	19	589,141
Bourne	Barnstable	27	18,721
Boxborough	Middlesex	15	4,868
Boxford	Essex	12	7,921
Boylston	Worcester	8	4,008
Braintree	Norfolk	20	33,828
Brewster	Barnstable	27	10,094
Bridgewater	Plymouth	22	25,185
Brimfield	Hampden	5	3,339
Brockton	Plymouth	22	94,304
Brookfield	Worcester	5	3,051
Brookline	Norfolk	19	57,107
Buckland	Franklin	2	1,991
Burlington	Middlesex	15	22,876
Cambridge	Middlesex	17	101,355
Canton	Norfolk	20	20,775
Carlisle	Middlesex	15	4,717
Carver	Plymouth	23	11,163
Charlemont	Franklin	2	1,358
Charlton	Worcester	5	11,263
Chatham	Barnstable	27	6,625
Chelmsford	Middlesex	10	33,858
Chelsea	Suffolk	19	35,080
Cheshire	Berkshire	1	3,401
Chester	Hampden	21	1,308
Chesterfield	Hampshire	3	1,201
Chicopee	Hampden	21	54,653
Chilmark	Dukes	27	843
Clarksburg	Berkshire	1	1,686
Clinton	Worcester	9	13,435
Cohasset	Norfolk	20	7,261
Colrain	Franklin	2	1,813
Concord	Middlesex	15	16,993
Conway	Franklin	2	1,809
Cummington	Hampshire	3	978
Dalton	Berkshire	1	6,892
Danvers	Essex	14	25,212
Dartmouth	Bristol	26	30,666
Dedham	Norfolk	18	23,464
Deerfield	Franklin	2	4,750
Dennis	Barnstable	27	15,973
Dighton	Bristol	24	6,175
Douglas	Worcester	6	7,045
Dover	Norfolk	18	5,558
Dracut	Middlesex	10	28,562
Dudley	Worcester	5	10,036
Dunstable	Middlesex	10	2,829
Duxbury	Plymouth	23	14,248
East Bridgewater	Plymouth	22	12,974
East Brookfield	Worcester	5	2,097
East Longmeadow	Hampden	4	14,100
Eastham	Barnstable	27	5,453
Easthampton	Hampshire	3	15,994
Easton	Bristol	22	22,299
Edgartown	Dukes	27	3,779
Egremont	Berkshire	1	1,345
Erving	Franklin	2	1,467
Essex	Essex	13	3,267
Everett	Middlesex	16	38,037
Fairhaven	Bristol	26	16,159
Fall River	Bristol	25	91,938
Falmouth	Barnstable	27	32,660
Fitchburg	Worcester	9	39,102
Florida	Berkshire	1	676
Foxborough	Norfolk	7	16,246
Framingham	Middlesex	7	66,910
Franklin	Norfolk	6	29,560
Freetown	Bristol	26	8,472
Gardner	Worcester	9	20,770
Georgetown	Essex	12	7,377
Gill	Franklin	2	1,363
Gloucester	Essex	13	30,273
Goshen	Hampshire	3	921
Gosnold	Dukes	27	86
Grafton	Worcester	8	14,894
Granby	Hampshire	3	6,132
Granville	Hampden	4	1,521
Great Barrington	Berkshire	1	7,527
Greenfield	Franklin	2	18,168
Groton	Middlesex	9	9,547
Groveland	Essex	12	6,038
Hadley	Hampshire	3	4,793
Halifax	Plymouth	23	7,500
Hamilton	Essex	13	8,315
Hampden	Hampden	4	5,171
Hancock	Berkshire	1	721
Hanover	Plymouth	23	13,164
Hanson	Plymouth	23	9,495
Hardwick	Worcester	9	2,622
Harvard	Worcester	9	5,981
Harwich	Barnstable	27	12,386
Hatfield	Hampshire	3	3,249
Haverhill	Essex	12	58,969
Hawley	Franklin	2	336
Heath	Franklin	2	805
Hingham	Plymouth	20	19,882
Hinsdale	Berkshire	1	1,872
Holbrook	Norfolk	22	10,785
Holden	Worcester	8	15,621

Population Estimates for Massachusetts Communities, 2000, continued

TOWN NAME	COUNTY	CHNA	POPULATION
Holland	Hampden	5	2,407
Holliston	Middlesex	7	13,801
Holyoke	Hampden	21	39,838
Hopedale	Worcester	6	5,907
Hopkinton	Middlesex	7	13,346
Hubbardston	Worcester	9	3,909
Hudson	Middlesex	7	18,113
Hull	Plymouth	20	11,050
Huntington	Hampshire	21	2,174
Ipswich	Essex	13	12,987
Kingston	Plymouth	23	11,780
Lakeville	Plymouth	24	9,821
Lancaster	Worcester	9	7,380
Lanesborough	Berkshire	1	2,990
Lawrence	Essex	11	72,043
Lee	Berkshire	1	5,985
Leicester	Worcester	8	10,471
Lenox	Berkshire	1	5,077
Leominster	Worcester	9	41,303
Leverett	Franklin	2	1,663
Lexington	Middlesex	15	30,355
Leyden	Franklin	2	772
Lincoln	Middlesex	15	8,056
Littleton	Middlesex	15	8,184
Longmeadow	Hampden	4	15,633
Lowell	Middlesex	10	105,167
Ludlow	Hampden	21	21,209
Lunenburg	Worcester	9	9,401
Lynn	Essex	14	89,050
Lynnfield	Essex	14	11,542
Malden	Middlesex	16	56,340
Manchester	Essex	13	5,228
Mansfield	Bristol	24	22,414
Marblehead	Essex	14	20,377
Marion	Plymouth	26	5,123
Marlborough	Middlesex	7	36,255
Marshfield	Plymouth	23	24,324
Mashpee	Barnstable	27	12,946
Mattapoisett	Plymouth	26	6,268
Maynard	Middlesex	7	10,433
Medfield	Norfolk	7	12,273
Medford	Middlesex	16	55,765
Medway	Norfolk	6	12,448
Melrose	Middlesex	16	27,134
Mendon	Worcester	6	5,286
Merrimac	Essex	12	6,138
Methuen	Essex	11	43,789
Middleborough	Plymouth	24	19,941
Middlefield	Hampshire	3	542
Middleton	Essex	11	7,744
Milford	Worcester	6	26,799
Millbury	Worcester	8	12,784
Millis	Norfolk	7	7,902
Millville	Worcester	6	2,724
Milton	Norfolk	20	26,062
Monroe	Franklin	2	93
Monson	Hampden	4	8,359
Montague	Franklin	2	8,489
Monterey	Berkshire	1	934
Montgomery	Hampden	4	654
Mt. Washington	Berkshire	1	130
Nahant	Essex	14	3,632
Nantucket	Nantucket	27	9,520
Natick	Middlesex	7	32,170
Needham	Norfolk	18	28,911
New Ashford	Berkshire	1	247
New Bedford	Bristol	26	93,768
New Braintree	Worcester	9	927
New Marlborough	Berkshire	1	1,494
New Salem	Franklin	2	929
Newbury	Essex	12	6,717
Newburyport	Essex	12	17,189
Newton	Middlesex	18	83,829
Norfolk	Norfolk	7	10,460
North Adams	Berkshire	1	14,681
North Andover	Essex	11	27,202
North Attleboro	Bristol	24	27,143
North Brookfield	Worcester	5	4,683
North Reading	Middlesex	16	13,837
Northampton	Hampshire	3	28,978
Northborough	Worcester	7	14,013
Northbridge	Worcester	6	13,182
Northfield	Franklin	2	2,951
Norton	Bristol	24	18,036
Norwell	Plymouth	20	9,765
Norwood	Norfolk	20	28,587
Oak Bluffs	Dukes	27	3,713
Oakham	Worcester	9	1,673
Orange	Franklin	2	7,518
Orleans	Barnstable	27	6,341
Otis	Berkshire	1	1,365
Oxford	Worcester	5	13,352
Palmer	Hampden	4	12,497
Paxton	Worcester	8	4,386
Peabody	Essex	14	48,129
Pelham	Hampshire	3	1,403
Pembroke	Plymouth	23	16,927
Pepperell	Middlesex	9	11,142
Peru	Berkshire	1	821
Petersham	Worcester	2	1,180
Phillipston	Worcester	2	1,621
Pittsfield	Berkshire	1	45,793
Plainfield	Hampshire	3	589
Plainville	Norfolk	7	7,683
Plymouth	Plymouth	23	51,701
Plympton	Plymouth	23	2,637
Princeton	Worcester	9	3,353
Provincetown	Barnstable	27	3,431
Quincy	Norfolk	20	88,025
Randolph	Norfolk	20	30,963
Raynham	Bristol	24	11,739
Reading	Middlesex	16	23,708
Rehoboth	Bristol	24	10,172
Revere	Suffolk	19	47,283
Richmond	Berkshire	1	1,604
Rochester	Plymouth	26	4,581
Rockland	Plymouth	23	17,670
Rockport	Essex	13	7,767
Rowe	Franklin	2	351
Rowley	Essex	12	5,500
Royalston	Worcester	2	1,254
Russell	Hampden	4	1,657
Rutland	Worcester	9	6,353
Salem	Essex	14	40,407
Salisbury	Essex	12	7,827
Sandisfield	Berkshire	1	824
Sandwich	Barnstable	27	20,136
Saugus	Essex	14	26,078
Savoy	Berkshire	1	705
Scituate	Plymouth	20	17,863
Seekonk	Bristol	24	13,425
Sharon	Norfolk	20	17,408
Sheffield	Berkshire	1	3,335
Shelburne	Franklin	2	2,058
Sherborn	Middlesex	7	4,200
Shirley	Middlesex	9	6,373

Population Estimates for Massachusetts Communities, 2000, continued

TOWN NAME	COUNTY	CHNA	POPULATION
Shrewsbury	Worcester	8	31,640
Shutesbury	Franklin	2	1,810
Somerset	Bristol	25	18,234
Somerville	Middlesex	17	77,478
South Hadley	Hampshire	3	17,196
Southampton	Hampshire	3	5,387
Southborough	Worcester	7	8,781
Southbridge	Worcester	5	17,214
Southwick	Hampden	4	8,835
Spencer	Worcester	5	11,691
Springfield	Hampden	4	152,082
Sterling	Worcester	9	7,257
Stockbridge	Berkshire	1	2,276
Stoneham	Middlesex	16	22,219
Stoughton	Norfolk	22	27,149
Stow	Middlesex	7	5,902
Sturbridge	Worcester	5	7,837
Sudbury	Middlesex	7	16,841
Sunderland	Franklin	2	3,777
Sutton	Worcester	6	8,250
Swampscott	Essex	14	14,412
Swansea	Bristol	25	15,901
Taunton	Bristol	24	55,976
Templeton	Worcester	9	6,799
Tewksbury	Middlesex	10	28,851
Tisbury	Dukes	27	3,755
Tolland	Hampden	4	426
Topsfield	Essex	13	6,141
Townsend	Middlesex	9	9,198
Truro	Barnstable	27	2,087
Tyngsborough	Middlesex	10	11,081
Tyringham	Berkshire	1	350
Upton	Worcester	6	5,642
Uxbridge	Worcester	6	11,156
Wakefield	Middlesex	16	24,804
Wales	Hampden	5	1,737
Walpole	Norfolk	7	22,824
Waltham	Middlesex	18	59,226
Ware	Hampshire	3	9,707
Wareham	Plymouth	26	20,335
Warren	Worcester	5	4,776
Warwick	Franklin	2	750
Washington	Berkshire	1	544
Watertown	Middlesex	17	32,986
Wayland	Middlesex	7	13,100
Webster	Worcester	5	16,415
Wellesley	Norfolk	18	26,613
Wellfleet	Barnstable	27	2,749
Wendell	Franklin	2	986
Wenham	Essex	13	4,440
West Boylston	Worcester	8	7,481
West Bridgewater	Plymouth	22	6,634
West Brookfield	Worcester	5	3,804
West Newbury	Essex	12	4,149
West Springfield	Hampden	4	27,899
West Stockbridge	Berkshire	1	1,416
West Tisbury	Dukes	27	2,467
Westborough	Worcester	7	17,997
Westfield	Hampden	21	40,072
Westford	Middlesex	10	20,754
Westhampton	Hampshire	3	1,468
Westminster	Worcester	9	6,907
Weston	Middlesex	18	11,469
Westport	Bristol	25	14,183
Westwood	Norfolk	18	14,117
Weymouth	Norfolk	20	53,988
Whately	Franklin	2	1,573
Whitman	Plymouth	22	13,882
Wilbraham	Hampden	4	13,473
Williamsburg	Hampshire	3	2,427
Williamstown	Berkshire	1	8,424
Wilmington	Middlesex	15	21,363
Winchendon	Worcester	9	9,611
Winchester	Middlesex	15	20,810
Windsor	Berkshire	1	875
Winthrop	Suffolk	19	18,303
Woburn	Middlesex	15	37,258
Worcester	Worcester	8	172,648
Worthington	Hampshire	3	1,270
Wrentham	Norfolk	7	10,554
Yarmouth	Barnstable	27	24,807

1. MDPH 2000 Preliminary Population Estimates (released January, 2002).

Population Estimates for Massachusetts Community Health Network Areas (CHNA) and Counties, 2000[1]

CHNA	POPULATION	COUNTY	POPULATION
1. Community Health Network of Berkshire County	134,953	Barnstable	222,230
2. Upper Valley Health Web (Franklin County)	86,889	Berkshire	134,953
3. Partnership for Health in Hampshire County (Northampton)	150,077	Bristol	534,678
4. The Community Health Connection (Springfield)	291,665	Dukes	14,987
5. Community Health Network of Southern Worcester County	113,702	Essex	723,419
6. Community Partners for Health (Milford)	152,117	Franklin	71,535
7. Community Health Network of Greater Metro West (Framingham)	374,478	Hampden	456,228
8 .Community Wellness Coalition (Worcester)	289,834	Hampshire	152,251
9. Fitchburg/Gardner Community Health Network	250,362	Middlesex	1,465,396
10. Greater Lowell Community Health Network	270,083	Nantucket	9,520
11. Greater Lawrence Community Health Network	182,025	Norfolk	650,308
12. Greater Haverhill Community Health Network	144,275	Plymouth	472,822
13. Community Health Network North (Beverly/Gloucester)	118,280	Suffolk	689,807
14. North Shore Community Health Network	278,839	Worcester	750,963
15. Greater Woburn/Concord/Littleton Community Health Network	208,406		
16. North Suburban Health Alliance (Medford/Malden/Melrose)	261,844	**STATE**	**6,349,097**
17. Greater Cambridge/Somerville Community Health Network	278,402		
18. West Suburban Health Network (Newton/Waltham)	253,187		
19. Alliance for Community Health (Boston/Chelsea/Revere/Winthrop)	746,914		
20. Blue Hills Community Health Alliance (Greater Quincy)	365,457		
21. Four (For) Communities (Holyoke, Chicopee, Ludlow, Westfield)	159,254		
22. Greater Brockton Community Health Network	232,260		
23. South Shore Community Partners in Prevention (Plymouth)	180,609		
24. Greater Attleboro-Taunton Health & Education Response	242,659		
25. Partners for a Healthier Community (Fall River)	140,256		
26. Greater New Bedford Health & Human Services Coalition	195,533		
27. Cape and Islands Community Health Network	246,737		

1. MDPH 2000 Preliminary Population Estimates (released January, 2002).

GLOSSARY

Adequacy of Prenatal Care Utilization (APNCU) Index
The Adequacy of Prenatal Care Utilization Index, developed by Dr. Milton Kotelchuck, is the measure used in this publication to classify the adequacy of prenatal care received by Massachusetts resident mothers. (*Please note: previous to this publication, the Kessner Index was used to measure adequacy of prenatal care; please see definition for Kessner Index below*.) The APNCU Index has five categories (adequate intensive, adequate basic, intermediate, inadequate, and unknown), based on the month of pregnancy in which prenatal care begins and the percent of expected prenatal care visits for the time period during which a woman receives prenatal care services. Please see Technical Notes for more details.

Birthweight
The weight of an infant recorded at the time of delivery. It may be recorded in either pounds/ounces or grams. If recorded in pounds/ounces, it is converted to grams for use in this report.

1 pound = 453.6 grams
1,000 grams = 2 pounds and 3 ounces

Birthweight Categories

Normal birthweight (NBW):	An infant's weight of 2,500 grams (approximately 5.5 pounds) or more recorded at birth.
Low birthweight (LBW):	An infant's weight of less than 2,500 grams (5.5 pounds) recorded at birth.
Very low birthweight (VLBW):	An infant's weight of less than 1,500 grams (3.3 pounds) recorded at birth.

Cesarean Section or C-Section
Primary: A mother's first Cesarean section delivery.
Repeat: A Cesarean delivery that has been preceded by at least one Cesarean delivery.

Community Health Network Areas (CHNAs)
The Department of Public Health, in collaboration with health service providers, coalition members, and interested citizens, has designated 27 areas for community health planning. It is the Department's intention to foster in each of these areas the development of Community Health Networks -- consortia of health care providers, human service agencies, schools, churches, youth, parents, elders, advocacy groups, and individual consumers -- to address the health needs of the community. These community coalitions will participate in monitoring outcomes and progress of strategies and responses to those health needs.

It is hoped the Networks will mobilize around key health issues impacting the community, promote prevention efforts, enhance access to care, provide opportunities for more collaboration among agencies, and create a client-centered, outcome-oriented health service delivery system. Community Health Networks will also promote efficiency in service delivery by working to reduce duplication and overlap, and by identifying gaps in service.

Community Health Network Areas (cont.)

A Community Health Network Area (CHNA) is defined as an aggregation of cities and towns. In the current publication, we have presented some data by CHNA. To determine which cities and towns make up a particular CHNA, the table on pages 124-126 provides the appropriate CHNA code for each city and town.

The data published in this volume reflect the definitions of CHNAs instituted in January 1997 and the corresponding CHNA names.

Confidence Intervals

The confidence interval (CI) for the infant mortality rate (IMR) is a range of values that has a 95% chance of including the underlying risk of an infant death. Observed rates are subject to statistical variation; even if the underlying risk of infant death is identical in two subpopulations, the observed IMRs for the subpopulations may differ because of random variation. The confidence interval describes the precision of observed IMR as an estimate of the underlying risk of infant death, with a wider interval indicating less certainty about this estimate. The width of the interval reflects the size of the subpopulation and the number of infant deaths; smaller subpopulations with fewer infant deaths lead to wider confidence intervals.

Ethnicity

See the section in the Technical Notes of the Appendix entitled: “Changes in the Collection of Race and Ethnicity Information.”

Fetal Death

A stillbirth delivered, extracted or expulsed, at 20 weeks gestation or more and / or weighs 350 grams or more.

Healthy Start

A Massachusetts-funded program providing services and financing for prenatal care to low-income pregnant women who lack health insurance, but do not qualify for Medicaid.

Infant

A child whose age is less than one year (365 days).

Infant Death

Death of a child whose age is less than one year.

Kessner Index (Adequacy of Prenatal Care)
A measure of adequacy of prenatal care, used in *Advance Data: Births* and *Massachusetts Births* publications prior to 2001. The Kessner Index classifies prenatal care as one of 5 categories (adequate, intermediate, inadequate, no prenatal care, and unknown), based on the trimester in which prenatal care began and the number of prenatal visits. The classification adjusts for gestational age to allow for proper classification of premature births, and is as follows:

Category	Trimester Care Began	Number of Visits
Adequate	1	9 or more
Intermediate	1	5-8
	2	5 or more
Inadequate	1	1-4
	2	1-4
	3	1 or more
No prenatal care	--	0
Unknown	Unknown	Unknown

Live Birth
A live birth is any infant who breathes or shows any other evidence of life (such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles) after separation from the mother's uterus, regardless of the duration of gestation.

Low Birthweight (LBW)
See Birthweight Categories.

Maternal Death
The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes.

Mother’s Birthplace
In this publication, birth characteristics are presented according to mother’s birthplace: those who were born in the 50 states and District of Columbia, or “U.S. States / D.C.”; those who were born in Puerto Rico, the US Virgin Islands, and Guam, or “Puerto Rico/U.S. Territories”; and those who were born outside of the U.S. and Puerto Rico/U.S. territories, or “Non-U.S.-Born”.

Neonatal
Infants under 28 days of age.

Neonatal Death
Death of a child whose age is less than 28 days.

Non-U.S.-Born Women
See Mother’s Birthplace.

Occurrence Birth
A birth occurring in the Commonwealth of Massachusetts, regardless of the residency of the mother. For individual cities/towns, an occurrence birth represents any birth occurring in that city/town, regardless of the residence of the mother. See Resident Birth.

Parity
The total number of live infants ever born to a woman, including the current birth.

Perinatal
Referring to the time period immediately before and after birth.

Perinatal Death
Death to a fetus of 28 weeks gestation or older or an infant less than 7 days old.

Plurality
The number of births to a woman produced in the same gestational period. A singleton is the birth of one infant; twins represent the births of two infants, etc.

Post Neonatal
A child whose age is at least 28 days, but less than one year.

Post Neonatal Death
Death of a child whose age is at least 28 days, but less than one year.

Prenatal Care Source of Payment
Categories used in this publication include:

Public = Government programs including Commonhealth, Healthy Start, Medicaid/MassHealth, and Medicare (may be HMO or managed care), or free care;
Private = Commercial indemnity plan, commercial managed care (HMO, PPO, IPP, IPA, and other), or other private insurance;
Other = Worker's Compensation and other sources;
Self-paid.

Pregnancy-Associated Death
The death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause.

Race
See the section in the Technical Notes in the Appendix entitled: "Changes in the Collection of Race and Ethnicity Information."

Resident Birth
The birth of an infant whose mother reports that her usual place of residence is in Massachusetts. In Massachusetts, a resident is a person with a permanent address in one of the 351 cities or towns. Vital statistics data may be presented in terms either of residence or occurrence. All data in this publication, except all data in Tables 22, 23, 24, and selected data in Table 25 are resident data. Resident data include all events that occur to residents of the Commonwealth, wherever they occur. Occurrence data include all events that occur within the state, whether to residents or nonresidents. There is an exchange agreement among the 50 states, District of Columbia, Puerto Rico, Virgin Islands, Guam, and Canada that provides for exchange of copies of birth and death records. These records are used for statistical purposes only, and allow each state or province to track the births and deaths of its residents.

Vaginal Birth After Cesarean (VBAC)
A vaginal delivery of an infant to a mother who has had at least one prior Cesarean section delivery.

Very Low Birthweight (VLBW) -- See Birthweight Categories.

Massachusetts Birth Certificate: 2001

USE ONLY STATE APPROVED RIBBONS AND MASS. STANDARD INK
AS REQUIRED BY GEN. LAWS, CHAP. 66, SECT. 4

The Commonwealth of Massachusetts
DEPARTMENT OF PUBLIC HEALTH
REGISTRY OF VITAL RECORDS AND STATISTICS
STANDARD CERTIFICATE OF LIVE BIRTH

STATE USE ONLY

1. RECORD NUMBER: 768283
1A. CERTIFICATE NUMBER (DPH USE ONLY)
2. FACILITY NUMBER
22A. SOCIAL SECURITY CARD
INITIALS
22B. RESIDENT COPY
INITIALS
1. OCCURRENCE

CHILD

3. PLACE OF BIRTH
3C. CITY/TOWN
3B. COUNTY
3A. FACILITY NAME-IF NOT IN FACILITY, NUMBER AND STREET
3D. REGISTERED NUMBER
NAME 4A. FIRST 4B. MIDDLE 4C. LAST
5. SEX 6A. PLURALITY 6B. BIRTH ORDER 7. TIME 8. DATE OF BIRTH (Month, Day, Year)

SAMPLE

CERTIFIER

9A. NAME 9B. TITLE
9C. CERTIFIER TYPE 9D. LICENSE NUMBER
9E. NUMBER AND STREET 9F. CITY/TOWN 9G. STATE 9H. ZIP CODE

MOTHER

NAME 10A. FIRST 10B. MIDDLE 10C. LAST 10D. MAIDEN SURNAME
BIRTHPLACE 11A. CITY/TOWN 11B. STATE/COUNTRY 12. DATE OF BIRTH (Month, Day, Year)
RESIDENCE (Do not use mailing address) 13A. NUMBER AND STREET 13B. CITY/TOWN 13C. COUNTY 13D. STATE 13E. ZIP CODE

FATHER

NAME 14A. FIRST 14B. MIDDLE 14C. LAST
BIRTHPLACE 15A. CITY/TOWN 15B. STATE/COUNTRY 16. DATE OF BIRTH (Month, Day, Year)

INFORMANT

17A. I (WE) CERTIFY THAT THE PERSONAL INFORMATION APPEARING ABOVE IS TRUE AND CORRECT. 17B. RELATIONSHIP TO CHILD
17C. DATE SIGNED (Month, Day, Year) 17D. MAILING ADDRESS (If different from item # 13 above) NUMBER AND STREET CITY STATE ZIP CODE

CLERK

18. DATE OF RECORD (Month, Day, Year) 19. SUPPLEMENT FILED (Month, Day, Year) 20. CLERK/REGISTRAR
21. DPH USE ONLY

R-101 • 100M • 10-98

Massachusetts Births 2001 Evaluation Form

TO OUR READERS:
In an attempt to better serve our users, we are enclosing this evaluation form. Please take the time to complete this questionnaire and return it to the address at the bottom of the page. Thank you.

What tables and charts do you find most useful?
What tables and charts do you find least useful?
Are there other tables and charts that you would like added to this publication? If yes, please describe them in detail.
Do you have other comments or suggestions?
Name (optional): **Address:** **(For those who received the publication by mail)** Is the mailing label address correct? If not, please correct the address. Thank you.

Please return your comments to:
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Division of Research and Epidemiology
Bureau of Health Statistics, Research and Evaluation
Massachusetts Department of Public Health
250 Washington Street Boston, MA 02108

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